Practical

FARMER

THE

PRACTICAL FARMER:

BEING A

NEW AND COMPENDIOUS

System of Husbandry,

ADAPTED TO THE DIFFERENT SOILS AND CLIMATES OF AMERICA.

CONTAINING THE

MECHANICAL, CHEMICAL AND PHILOSOPHICAL

ELEMENTS OF AGRICULTURE.

WITH MANY OTHER USEFUL AND INTERESTING SUBJECTS

BY *JOHN SPURRIER*,

AN OLD EXPERIENCED FARMER, LATE OF THE COUNTY OF HERTS, IN GREAT-BRITAIN: AND NOW OF BRANDYWINE HUNDRED, COUNTY OF NEW-CASTLE, AND STATE OF DELAWARE.

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To Thomas Jefferſon, Eſq.

Secretary of the United States.

SIR,

I AM happy in being permitted to dedicate the following treatiſe to you, as well on account of your being a promoter of every degree of uſeful knowledge, as by your judicious conduct in public and private life: ſetting an example worthy of imitation.—And as greater improvements have been made in this country in other arts, than in agriculture, which of all ſciences I conceive to be the moſt beneficial to mankind: the following attempt to improve in that line can claim no other merit than a ſincere intention of endeavouring to promote and increaſe, upon the

moſt rational principles, the real ſtrength and wealth of this commonwealth. With this view, I flatter myſelf I ſhall obtain your approbation and patronage; and ſhall think myſelf happy, if I may be deemed to have been not altogether an uſeleſs member to ſociety.

I have the honor to be,

With the higheſt reſpect,

Your moſt obedient,

Humble ſervant,

JOHN SPURRIER.

Brandywine hundred, county of New-Caſtle, and ſtate of Delaware, September 1792.

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An explanation of provincial words made uſe of in this treatiſe.

Boughting—Is the throwing two thoroughs againſt each other, by going backwards and forwards with the plough.

Baulks---Is faſt ground that the plough miſſed.

An etch—Is land that has been prepared by plowing after other grain.

Fallow plowing—Is ſeveral plowings to clear the land from weeds, and prepare it for a fallow crop

A lay—Is ground broke up that has been in graſs.

Hoving of cattle—Is a ſwelling cauſed by the wind in clover and lucern graſs.

Tilt or *tilth*—Is when the ground is reduced by the plough and harrow to a fineneſs like powder.

Tiller—Is to branch or ſhoot out many ſtalks from the root.

Nitrous dews—Are ſalts in the air which deſcend on the earth in form of dews, which are beneficial to all roots they come at.

Ally—Is that diſtance between the rows of grain or vegetables.

Staple—Is that part of the earth or mould fit for vegetation above the clay, gravel, &c.

THE

PRACTICAL FARMER;

BEING A

NEW AND COMPENDIOUS

Syſtem of Huſbandry, &c.

ON AGRICULTURE.

THE numerous volumes which have already been publiſhed on *agriculture*, by authors of the greateſt abilities and experience, render it in ſome meaſure, a kind of preſumption to attempt making public any further obſervations and experiments.—But when I reflect that *agriculture* is not reduced to a regular ſyſtem (eſpecially in this country) or arrived at that degree of perfection which other arts, manufactures, and ſciences have attained;—and as it is univerſally acknowledged, that every perſon who contributes, or endeavours to contribute to the public

public good, deſerves applauſe; I truſt that ſuch obſervations and improvements as tend to promote the public welfare, will be deemed worthy of ſome attention.

Activity and inclination, induced me to make practical agriculture and improvements in huſbandry, my amuſement and principal ſtudy: and having ſtudied moſt authors in that ſcience, and their experiments and maxims laid down, enables my proving which are moſt advantageous; and as I entertain the opinion that every member of ſociety ought to communicate what he has diſcovered, induces me to publiſh the preſent treatiſe, which I have endeavoured to write in ſuch plain language as may ſuit the meaneſt capacity. The multiplicity of improvements that are now making in arts, ſciences, mechanics and manufactures in this country, ſhould animate the farmer to be no leſs attentive to agriculture; which is ſo neceſſary for the ſubſiſtence and welfare of mankind, in this and every other country.—The moſt illuſtrious heroes, philoſophers and poets among the ancients, ſtudied to encourage, improve, and even practiſed agriculture. The moſt noble Roman conſuls and dictators, were taken from the plough. The ſenators of that once flouriſhing people, and the moſt learned men of all ages, made

made agriculture their chief ſtudy and employment; eſteeming it to be the original and genuine ſource of the ſtrength, wealth and proſperity of every nation.

The noble and moſt learned and ingenious men of the preſent age, animated with the public welfare, have condeſcended not only to ſtudy and practiſe agriculture, but likewiſe to encourage and promote this nobleſt of arts with indefatigable zeal. It is to ſuch men of underſtanding and liberal ſentiments, the public are indebted for the very great improvements made in agriculture and all other arts.

Every man whoſe natural abilities have been cultivated by education, ſhould certainly ſtudy the improvement of ſuch arts and ſciences, as tend to promote the public welfare.

Man was not born merely to eat, drink, ſleep, or to ſpend his time in hunting, ſhooting, gaming, idleneſs, diſſipation, and ſenſual gratifications; but to be induſtrious and uſeful to ſociety; and ought to leave ſome record of his actions as a teſtimonical of his endeavours, at leaſt to be uſeful to the preſent and future generations.

Men

Men purſue different objects as their inclinations and fancies lead them; but of all the arts, agriculture, when properly conducted, is one of the moſt uſeful, profitable, pleaſing, rational and healthful amuſements in life.

The agriculturiſt, while riding or walking round his farm, fully enjoys the ſweet refreſhing breeze, ſo neceſſary to the preſervation of his health; and while he attends to his buſineſs, may entertain himſelf with rural ſports, every field and experiment preſent new objects to his view; pleaſing reſearches into the works of providence: ſuch as the different forms and growth of plants and grain: analizing the great diverſity of ſoils and manures, that he may thereby aſcertain their properties, and be beſt enabled to deſtroy the particles injurious to vegetation, and enrich the ground.

The practice of huſbandry requires precept, reflection and ſtudy. Agriculture cannot be benefitted by theory alone; but when theory is united with repeated experiments and facts, agriculture, as all other arts, may be reduced to a regular ſyſtem.

The operation of manures on different ſoils, may be accounted from their known properties

properties, aſcertained by repeated experiments.

Hence, every agriculturiſt ought to ſtudy and know the qualities of different ſoils, as well as manures, that they may be properly applied to each other. This ſcience I deem to be one of the moſt uſeful of all human arts: is ſimilar to a phyſician's knowing the cauſe of diſeaſes, the properties of medicines, and their moſt effectual applications.

The practice of agriculture is in general confined, either to perſons who have not had a ſufficient education to enable them to keep regular accounts, or who are inattentive and do not chooſe to take that trouble; without which, it is impoſſible to aſcertain the profits and loſs thereon—hence they cannot poſſibly attain the truth.

The farmer ſhould be very particular in keeping regular accounts; if he cannot keep the produce of each field ſeparate, he will find but very little trouble to cut two ſquare perches of the beſt, and the ſame quantity of the worſt part of his crop, which carried into the barn and threſhed out, will employ but little time; if he will proportion the amount of the perches ſo cut, to 160, (which an

an acre contains) the produce per acre of ſuch field may be eaſily aſcertained, and ſhould be immediately minuted in his book; he will be ſoon convinced of the utility of keeping regular accounts; he will thereby be beſt inſtructed whether two or three plowings or more, if manured with lime, aſhes, dung, or compoſts, when applied, with the quantity per acre; the time of ſowing, and the courſe of crops preceding, are the moſt advantageous.

Should the amount of ſo ſmall a quantity as four perches of land be difficult to calculate by meaſure, it may be eaſily weighed, and proportioned according to the weight of a buſhel of the ſame produce: theſe calculations may be expeditiouſly made when the hurry of the day is over, or in wet weather, when other buſineſs does not interfere. By minuting and regiſtering ſuch accounts in a regular manner, they can be referred to at any future period: the agriculturaliſt will thereby be enabled to avoid the wrong, and to purſue the beſt and moſt advantageous method. Such a plan will ſoon become habitual, amuſing, inſtructive and profitable.

Enabled from my own experience, the regular accounts I have kept of each ſeparate field

field, and obſervations made on the mode of other farmers cultivation ; I may venture to aſſert, that many real loſſes are ſuſtained by improper management: ſuch for inſtance, not plowing ſo deep as the nature of the ſoil will admit, or not allowing a ſufficient number of plowings and harrowings to pulverize and clear the land of weeds ; the application of raw dung, unmixed with earth immediately for the crop, harbouring and nouriſhing inſects and weeds, which greatly injure and often deſtroy the crops of grain, not introducing a meliorating, but an improper ſucceſſion of impoveriſhing crops.

Moſt authors on agriculture have been too complex and ambiguous; but the accounts of my experiments in this treatiſe, will ſufficiently elucidate the forms I have made uſe of, which I deem to be the moſt ſimple, eaſy, and beſt adapted to the meaneſt capacity.

Farmers may be poſſeſſed of great natural abilities, and knowledge in the common mode of their anceſtors ; but every farmer is not a ſcholar, mechanic, chemiſt, or philoſopher. Their knowledge, and the methods they purſue in general, extend no further than that of their predeceſſors, or the cuſtom of the country where they reſide. Any diſ-

coveries made by them are reſerved to themſelves, and themſelves only benefited by it; but men of ingenious and liberal diſpoſitions, no ſooner make diſcoveries, than they are communicated to the public.

Experiments can be of little uſe when extended no further than for our own private inſtruction; and reaſoning without experiments avail but little in the practical arts; theory without practice, is ſimilar to a ſhadow without ſubſtance; but when reaſoning is founded on ſcience combined with experiments minutely attended to, it is from thence only the ingenious artiſt or agriculturiſt is enabled to draw ſuch concluſions as are of real utility.

The great and general ambition of farmers is to occupy large farms; the more they poſſeſs, the greater conſequence they think themſelves of; but one acre of land, properly managed, will produce more than four, by improper cultivation.

Were farmers to occupy no more ground than they could cultivate in a maſterly manner, there would not be that general complaint of ſcanty crops, or of the land being worn out; for there is no land of any ſort whatever,

whatever, (which has a ſufficient depth of mould for plowing) but what may be rendered fertile by prudent cultivation, and the application of proper manures; and in proportion to their different degrees of natural richneſs, be managed in ſuch manner as to produce luxuriant and profitable crops of ſome ſpecies of vegetables: and that by bad conduct good ſoils oftentimes produce but very ſcanty crops; when the blame is too frequently imputed to their natural poverty. Hence, for inſtance, in the brewing of beer, or the baking of bread, the materials may be of the very beſt quality, yet, from the want of care and proper management, both are ſpoiled, or greatly injured; ſo it is with land.

The wearing out of land is occaſioned by a continual cropping, taking off the crops, and giving it no return or reſt, which ſhould be given by ſowing in rotation ſuculent graſſes or pulſe—ſuch as clover, timothy, lucern, ſaintfoin, trefoil, tears, vetches, peas and beans, to recover that etherial ſpirit of the world, which is loſt by improper management.

For this globe of the earth that affords unto us the ſubſtance not only of ourſelves, but

but of all creatures ſublunary, is impregnated with a ſpirit moſt ſubtile and etherial, which the Original or Father of nature has placed in this world as the inſtrument of life, and motion of every thing. The ſpirit is that which inceſſantly adminiſters to every animal its generation, life, growth and motion; to every vegetable its original and vegetation. It is a vehicle that carries with it the ſulphurious and ſaline parts, whereof the matter, ſubſtance, or body of all vegetables and animals are formed and compoſed.—It is the operator or workman that tranſmutes by its active heat, the ſulphurious and ſaline parts of the earth or water into that variety of objects we daily behold or enjoy. It continually perſpires through the pores of the earth, carrying with it the ſulphurious and ſaline parts, the only treaſure the farmer ſeeks for.

Providence moſt wonderfully aſſiſts the induſtry of man, by celeſtial and atmoſpherical influences, which greatly tend to enrich the earth, and to promote vegetation.

As the qualities of all ſoils vary conſiderably, every agriculturiſt ought to make himſelf well acquainted with the nature of his land, as alſo the property of manures; a judicious

dicious application of which, with a proper courſe of crops and thorough tillage, are the chief and grand ſecrets of agriculture.

And, in order that the agriculturiſt may be enabled to obtain a greater knowledge of the properties of different ſoils and manures, as well as other parts of huſbandry, I will firſt proceed to their analyſis, ſo far as is neceſſary and really uſeful.

The application of certain ſubſtances to analiſe ſoils and manures.

1ſt.—Diſtil a ſufficient quantity of water, or uſe pure rain water, which has been received in the open air, at a diſtance from ſmoke or duſt; in which infuſe the earth forty-eight hours in a gentle heat, ſtirring it often; when cold, and the earth has ſubſided, filter the water, which will retain the taſte of any metallic or earthy ſalt.—— Or,

2d.—Drop into the above filtrated infuſion, the ſolution of fixed vegetable alkali; if there be any metallic or earthy ſalt, it will precipitate.

3d.

3d—Evaporate the infuſion; if it contains any neutral ſalt, it will cryſtallize.

4th.—To the filtrated infuſion, apply an infuſion of galls; if there be any earthy or metallic ſalt, the colour will be read, if alum or copper; a deep purple, if iron.

5th—To the filtrated infuſion, apply the ſyrop of violets; if it turns red, the ſoil contains an acid; if green, an abſorbent earth.

☞ All acid bodies effervesce violently when mixed with alkaline ſubſtances, and turn a blue tincture of violets red; whereas alkaline ſubſtances mixed with the ſame tincture, turn it green.

6th.—Clay or earth containing calcareous earth, put into vinegar will effervesce, and blunt or deſtroy the acidity, in proportion to the quantity of calcareous earth contained therein.

7th.—Red and blackiſh ſoils frequently contain iron or other metallic particles, which may be viſibly diſcovered by a microſcope, and may be perceived to glitter, by being expoſed to the ſun's rays.

All

☞ All metallic and earthy ſalts are poiſonous to vegetation, which with acids, are decompoſed by quick lime, alkaline manures, and good tillage.

8th.—Clay and earths, dried and powdered, thrown on fuſed nitre, if a few ſparks are produced, it contains a ſmall quantity of oil, and according to the increaſe of deflagration and detonation, ſo, in proportion is the richneſs of the land.

9th.—Dry and powder rotten dung; throw it on fuſed nitre, its detonation and deflagration will be very great.

☞ Nitre will melt in the fire and grow red hot; is not inflammable of itſelf, but when oil or any ſubſtance containing oily particles, is added to it, it will detonate and deflagrate, in proportion to the quantity of oil contained therein.

10th.—Marle expoſed in the open air, will fall into powder, or put into pure rain water will diſſolve; it will blunt the acidity of vinegar.

☞ As clays cannot be diſcovered from marle by its appearance, the above experiments

ments will diſcover it, as the effects will be entirely oppoſite.

11th.—Quick lime yields neither ſalt nor oil by diſtillation; but when mixed with the ſoil, it ſtrongly attracts moiſture, ſaline, and oily ſubſtances, which with metallic particles and acids, are decompoſed and diſſolved by lime.

12th—Chalk freſh dug, yields neither oil nor ſalt by diſtillation; but when mixed with the ſoil, attracts oils and ſalts; effervesces with, and abſorbs acids.

13th—Pitcoal aſhes by diſtillation or infuſion, yields neither oil nor ſalt, but attracts moiſture, abſorbs acidities, greatly lightens and adds friablity to ſtiff cold ſoils under tillage.

14th—Wood, and all other vegetable aſhes, boiled, or infuſed in water, yield a fixed alkaline ſalt by evaporation.

15th—Urine yields oils and ſalts by diſtillation or ſublimation.

16th—In order that I might be enabled to form ſome idea of the effects of the atmoſphe

rical

cal influences on ſoils, in the month of October I pared the turf from a very poor loamy earth, and dug up about three quarts, which was divided into three flat pans. No. 1 was put into a cloſe place ſecured from the air: No. 2 was placed in an open ſituation, ſo as to be expoſed to the ſun the whole day: No. 3 was placed near a wall with a north-eaſt aſpect, where it only received the benefit of the morning ſun till ten o'clock. The mould in each pan was carefully turned with a trowel ſix times in twelve months, when I took a tea ſpoonful out of each pan; the earth was pulverized and dried, and thrown on fuſed nitre.—No. 1 produced but a few ſparks; No. 2 produced twice as many with a feeble detonation; No. 3 detonated and deflagrated twice as ſtrong as No. 2. Hence I concluded from theſe experiments, that No. 1 being excluded from the atmoſphere received no benefit, that the atmoſpherical influences imbibed by No. 2 were exaled by the rays of the ſun, which operated on it the whole day—that No. 3 being ſhaded the greateſt part of the day from the ſun, it more effectually retained the atmoſpherical influences which it had imbibed, than No. 2, which was expoſed to the ſun.

Hence I preſume, and am fully convinced, that all tilled lands are greatly benefitted by the effects of air, rain, dew and froſt; and that the more the ground is ſhaded by the crops thereon, the leſs the exalation; of courſe the more the moiſture and oily particles are retained therein, and the greater is the putrid fermentation, particularly ariſing from eſculent plants.

The principles, of agriculture are deduced from mechanics, chemiſtry and natural philoſophy.

Of MECHANICS.

Mechanics are a branch of practical mathematics, which conſider the nature and laws of motion and moving powers, with their effects in machines, which are made ſubſervient to the various purpoſes of mankind; and it is by the knowledge of this ſcience, that the greateſt improvements are made of every power and force in nature; by which any work may be more expeditiouſly executed, and at the leaſt expence.

In all well-managed manufactories, the ſmalleſt ſavings of expence in materials, as well

well as labour, are never neglected. Thoſe articles which may appear trifling and very inconſiderable at firſt ſight, muſt, on a ſmall ſcale, in a few years, or in an extenſive line of buſineſs in one year, amount to a very conſiderable ſum. Therefore, why ſhould not agriculture admit of a ſimilar compariſon with manufactures?——This art is certainly of more real conſequence to the community.

The very great advantages derived from machines in manufactures, invented by ingenious men of the firſt abilities in that line, are ſufficiently known.

The great and good effects of new inventions in mechanics, are, by the wiſdom of the legiſlature well ſecured; individuals are protected againſt the oppreſſions, and unjuſtifiable combinations of avaricious and ſervile imitators; who may be compared to the drone ſupported by the labors of the induſtrious bee.——Such ſecurity to inventions, encourages the ingenious artiſt to riſque his labour and property in new and uſeful attempts.

Of CHEMISTRY.

Chemiſtry is an art by which mixed bodies are ſeparated, or reduced into their component parts ; thereby the ſeveral properties of ſoils and manures are diſcovered, that ſuch manures may be applied, as will deſtroy any bad qualities that prove hurtful and poiſonous to vegetation, and which fertilize the ſoil.

As all lands differ materially in their qualities, ſo different manures ſhould be accordingly applied.

SOILS.

A ſandy ſoil, as well as gravels, have no coheſion of their parts. They too readily admit the heat of the ſun to the roots of the plants, by which they are ſcorched and deſtroyed; and has not ſufficient tenacity to afford ſecurity againſt ſevere colds and hard froſts. Sand, without the mixture of earth, contains no oleaginous or other particles, that can contribute to vegetation ; rain and moiſture paſs through it too eaſily to afford nouriſhment

riſhment for plants; therefore the dung of horned cattle and hogs (which is rich and cooling) mixed with mud, clay or marle, is the moſt coheſive and enriching manure, will the longeſt retain moiſture, and at the ſame time convey proper nouriſhment; hence it is beſt adapted to ſuch ſoils;—and in proportion to the quantity mixed with the ſand, its tenacity and vegetative properties are encreaſed or decreaſed.

Green crops of turnips, buck-wheat, clover, or any other ſucculent graſſes, tares, or vetches, plowed in, or fed with ſheep hurdled thereon, greatly enrich ſuch ſoils—Green crops when plowed in, ſhould be immediately rolled with a heavy roller, which conſolidates the looſened earth, cauſes a ſpeedy fermentation, produces a mucilaginous matter, which gives tenacity to the ſoil, and is converted into nouriſhment for plants.

Of a CLAY SOIL.

Clayey ſoils differ as materially as ſandy ſoils. The oleaginous and earthy particles of ſome kinds of clay, are ſo cloſely combined as to retain water, which is permitted to eſcape only by evaporation.—All ſorts of clayey

clayey ſoils contain more or leſs oil, in proportion to its tenacity.

A tough clay retains moiſture ſo much as to rot the ſeeds and roots of plants. Clay does not admit the free acceſs of heat and air (which are eſſentially neceſſary for promoting vegetation) and it is ſo baked and hardened by the heat of the ſun, as to prevent the tender roots and fibres of plants from extending themſelves in ſearch of food. Hence ſuch manures as will open its pores, deſtroy its adheſion and correct its bad qualities, ſhould be applied. Lime, and coal or wood aſhes mixed with lime, are beſt adapted for clayey and ſtiff ſoils under the plow.

Of a LOAMY SOIL.

Loam is a medium between light and ſtiff ſoils; differs in quality as materially as either.

Black and hazel colored ſoils are generally the richeſt, and moſt proper for the ſupport of vegetables, as they contain a ſufficient degree of coheſion, and at the ſame time are ſo friable, as readily to admit the roots and fibres

bres of plants to extend themſelves in ſearch of nouriſhment.

Red and other coloured ſoils generally contain a mixture of iron, copper or lead, or ſome acid which is poiſonous to vegetation. A proper application of quick lime (as hereafter directed, with an increaſe of quantity, as exigencies may require,) will effectually diſſolve and deſtroy thoſe pernicious particles, which, with the aſſiſtance of dung and ſufficient plowings, will render the moſt barren ſoils fertile.

It muſt be remarked that according to the quantity of metallic particles impregnated with the ſoil, ſo in proportion ſhould the quantity of lime be accordingly applied.

Of SWAMPS *and* BOGGY SOILS.

Swamps and bogs generally conſiſt of rotten trees, roots of weeds, and other half-diſſolved vegetable ſubſtances, which having undergone ſome degree of putrefaction, are (ſimilar to all corrupted vegetables) turned into a black, rich, ſpungy kind of earth that readily imbibes moiſture; and its ſpungineſs

ariſes

ariſes more or leſs, in proportion to the quantity of mud or ſlime carried over it by floods, which with the acid contained in the ſtagnated moiſture prevent a complete putrefaction.

The firſt thing neceſſary to be done, in order to improve ſwampy and boggy ground, —is to make drains of a ſufficient depth to carry off the ſtagnated waters, as their ſurface are a compoſition of moſs, fibrous roots and coarſe graſs, they ſhould be pared (to ſuch depth as the roots penetrate) and burnt; ſuch aſhes abound with alkaline ſalts which, muſt be ſpread over the land—where lime can be conveninently procured, eighty buſhels per acre, ſhould be laid on in piles of about half a buſhel to a perch, and as ſoon as ſlacked, it muſt be ſpread over the aſhes (for the reaſon that will be aſſigned under the article wood aſhes) which ſhould be plowed in, not more than four or five inches deep. By this method a fermentation and putrefaction will enſue, and after being expoſed a few weeks to the influences of the atmoſphere, the ſurface ſhould be worked with loaded harrows, which will tear aſunder, and mix the lime and aſhes with the ſoil. The vegetable ſubſtances contained therein will ſoon be

be diſſolved, and converted into an exceeding rich and fertilizing manure.

The ſpecific gravity of lime and other manures are ſo great, as to be continually falling downwards; therefore it is eſſentially neceſſary that the firſt plowing ſhould not exceed the depth of four or five inches.

The ſecond plowing ſhould be to form the ridges, by which the aſhes and lime that were plowed in, will be turned upwards, and after being thoroughly incorporated with the ſoil by harrowing, may be planted with potatoes or ſuch other vegetables as may beſt ſuit the judicious huſbandman's inclination.

As ſwampy and boggy lands are generally light and ſpungy, an addition of marle, clay, or loam will add coheſion to their parts, and will, in a very ſhort time, moſt amply repay the agriculturiſt.

Of MANURES.

Lime, quick or unſlacked, contains no ſalt; when ſlacked, attracts oils, acids and ſalts, from the earth and atmoſphere. Clayey and other ſoils when firſt broken up or plowed, contain various mineral and poiſonous particles, weeds, worms, grubs and inſects; all which lime diſſolves. The oils and ſalts abſorbed from the earth and atmoſphere, then become ſo intimately united with the animal and vegetable ſubſtances already diſſolved by the lime, as to be converted into a ſoapy matter, by which they are rendered miſcible with water, and become the food of vegetables. Lime, by its expanſive force, opens, divides, and lightens a ſtiff ſoil, by which it is eaſier pulverized, and gives a greater friability to ſtiff ſoils, than any other ſubſtance whatever. It is thus the roots of plants are permitted to extend themſelves.

Lime, when too frequently and injudiciouſly uſed, is a great impoveriſher of lands kept long under tillage. It exhauſts the earth by abſorbing its oily particles; hence, the ſoil is rendered barren. The only remedy for ſuch miſconduct, by which the ſoil can be

reſtored,

reſtored, is a compoſt of rotten dung or earth, or ſcrapings of a lime-ſtone road and dung, twice turned and properly mixed ; or a thick crop of buck-wheat, clover, vetches, or turnips plowed in, and rolled with a heavy roller: ſuch management will ſoon recruit the ſoil, and reſtore it to its proper vigor.

Lime, when properly and judiciouſly applied, ranks firſt among the claſs of manures, particularly for all ſorts of ſtiff and loamy ſoils.

Of DUNG.

Dung of all ſorts contains ſalts and oils. The dung of horſes, hogs and ſheep, is the hotteſt and beſt adapted for ſtiff and cold ſoils.

Human ordure, the dung of poultry and rabbits, are all extremely hot and rich ; but are procured in ſuch ſmall quantities, as not to merit the huſbandman's particular attention. Hence ſhould be mixed with other dung or earth.

The

The dung of horned cattle is fat and cooling; therefore moſt proper for light, ſandy and gravelly lands.

When dung is carried into the field, where it is intended to be uſed, the higheſt headlands and banks ſhould be plowed or dug, and the dung depoſited thereon, with earth thrown over. The head-land being plowed and pulverized, will readily abſorb the eſſence of the dung; and whatever quantity of the diſſolved ſalts and oils, that may be waſhed off by ſucceſſive heavy rains, will be carried over, and greatly enrich that part of the field adjoining to the dung, as the head-lands are generally the higheſt and richeſt parts of the ground, the earth being mixed with the dung will make a good compoſt; and for twenty loads of dung when ſpread on by itſelf, ten loads by being thus managed, will prove nearly if not equally as advantageous as when dung only is laid on. Hence, two acres of land, in lieu of one, or in proportion, may every year be manured, excluſive of the advantage of making the land even.

Of FARM-YARDS *and* COMPOSTS.

The middle or center of the farm-yard ſhould be two feet lower than the border, by this the urine and eſſence of the dung will be ſaved, which otherwiſe are liable to be carried off by the rains; a pool or reſervoir ſhould be made on the loweſt ground adjoining, to receive the ſuperfluous drainings; which if ſprinkled over the land with a watering pot will be a good dreſſing.—In this yard ſhould be put a ſtratum of about ſix inches of rich earth, ant-hills, ſcrapings of roads, ſweepings of filth round the buildings, leaves of trees, corn-ſtalks, thiſtles and coarſe weeds, and all other articles that can be converted into manure over which throw your ſtable dung and all the refuſe ſtraw. This yard ſhould have a wall or cloſe fence eight or nine feet high, with ſheds againſt it, to keep the cattle warm and dry, and racks and mangers under them as well as cribs in the middle diſpoſed regularly to entice the cattle to go over all parts alike, in this yard the whole ſtock of cattle ſhould be turned to brouſe on hay or ſtraw every night; in the day time they can be turned into graſs, turnips, or what feed you have for them. Thoſe different articles will

will rot and imbime the eſſence of the dung laid on, as well as what the cattle make—when convenient opportunities permit of depoſiting alternate ſtratums in this manner, an exceeding good compoſt is made at a ſmall expence.

The foddering of the cattle in winter on this compoſt, will increaſe and enrich it; and in hot weather there ſhould frequently be laid a thin layer of mould over it, to prevent the ſun from exhaling from it any of its properties, and it ſhould be turned and mixed before it is put on the land.

Human urine and ſoap ſuds (which in general are thrown away) if they were put on this compoſt, would pay the farmer ſome pounds every year.

MUD *and* LIME.

Good fat mud from rivers or the bottom of pools or ponds mixed with lime, makes a good compoſt for all ſorts of lands.—To four loads of mud, (ſpread regularly to the ſize intended for the compoſt heap) put twenty buſhels of quick lime ſpread over the mud,

—and

—and ſo on alternately, to the quantity you would wiſh to make.--The mud to be the laſt layer or ſtratum.

This ſhould be done in the fall, for it to lay in that ſtate all winter—in the ſpring it ſhould be turned and well mixed; at midſummer give it another turning, when it will be ready to put on the land for wheat; ten loads to an acre is the quantity. I have had better crops of wheat by this management than my neighbours, who have put the ſame quantity of ſtable dung on their land.

BURNT-CLAY.

Burnt-clay is an abſorbent, and acts nearly ſimilar to lime, but not ſo powerfully. The method of burning it is as follows:

Get eight loads of clay, cut into ſpits, about as thick as a brick; let it be pretty will dried in the ſun, and having made a heap of bruſh and other wood, coal or other combuſtibles, laid one upon another about as large as a ſmall bon-fire, in a pyramidical form, bring the ſpits of clay, and lay them round the ſame, two or three ſpits thick, leaving only room to put in the fire; and then light the ſame. The

clay

clay, by the innate heat of the wood, &c. within, will ſoon take fire, and as it advances outwards, ſtill lay on more ſpits of clay, placing them in ſuch an order, ſo that the fire may be pent up within the heap, and never ſuffered to get out; for if you do, your labour will be loſt, and you muſt begin again.

After you have burnt up your eight loads of dry clay, the heat which is within, will be ſo great, as that it will fire any thing, and then you may lay on the clay green as it is dug out of the pit, being always watchful to keep a new addition of it; laying on one after another; but not too faſt, leaſt you ſmother the fire, and put it out: this you may enlarge and ſpread out at the feet, as the heap ſwells; and if occaſion be, there may be ſtages of boards laid, on which the men may ſtand who place the ſpits of clay. This being done, and the fire kept continually in, and watched night and day, you will ſoon have as large a heap as you pleaſe for the improvement of land; for the larger the heap grows, the eaſier it is to burn the clay. This is a moſt cheap dreſſing for arable or graſs land, and not only agrees with all ſorts of lands and ſituations: but alſo laid about the roots of young or old fruit-trees, pretty thick, enlarges

enlarges, multiplies, and accelerates their fruit.

Of WOOD ASHES.

Wood aſhes contain alkaline ſalts and abſorbent earth, attract moiſture and inflammable matter from the atmoſphere, and keep the earth in an open ſtate. Lime deprives wood aſhes and other alkalines of their fixed air, increaſes their purpoſes of a cauſtic, and enables them more readily to diſſolve oils and mucilaginous particles.

Wood and all other vegetable aſhes, from whatever vegetables they have been produced, are of one and the ſame quality for the purpoſes of agriculture; and ſhould (when conveniencies permit) be kept perfectly dry till they are uſed; when expoſed to the rains, the ſalts are waſhed out, and of courſe, the aſhes are not ſo efficacious.

Of SOOT.

Soot is a compoſition of fixed and volatile alkaline ſalts, oils, and a ſmall quantity of calcareous earth, ariſing from the fuel, with

the ſmoak, or may be rather deemed the ſmoak itſelf, gathered and fixed on the ſide of chimnies.

Soot is a moſt excellent top dreſſing for grain of all ſorts, and for cold ſtiff paſtures; it deſtroys moſs and kills inſects. When it can be procured on reaſonable terms, it is a cheap and effectual manure; but ſhould never be applied in a dry ſeaſon, as it will injure the blades of grain or graſs. The moſt proper quantity is from twenty-five to thirty buſhels per acre, ſowed early in the ſpring, before rain, which waſh it off the leaves of the plants into the ground: and its ſudden effects will ſoon be perceived, by the deep green and luxuriant growth of the crops.

Of COMMON SALT.

Common ſalt produced from ſea-water and ſprings, is originally the ſame; differs in ſtrength and ſome other qualities, according to the operation by which it is made; the quicker the liquor is evaporated, the weaker is the ſalt: when the liquor is evaporated over a ſtrong fire, part of the ſtrength or acid of the ſalt is raiſed with it. Hence, the more gentle the proceſs, the ſtronger is the

the ſalt. Salt of itſelf is not beneficial to vegetation; when decompoſed by being mixed with a proper compoſt, it may then aſſiſt to promote vegetation.

Of SEA SAND.

Sea ſand is a good manure for all lands and ſoils, particularly light ſandy lands. When carried immediately from ſuch parts of the ſhores as are daily overflowed by the tides, it is ſaturated with ſtrong ſalts of an alkaline nature, and putrid matters which the ſea-water contains; it adds tenacity to ſuch light ſoils, by the putrid ſaline particles attracting and retaining moiſture, which having undergone no operation of the fire, conveys its original properties in their natural ſtate. Hence it differs materially from common ſalt.

Of SEA WEEDS.

Sea weeds contain alkaline ſalts and mucilage; they ſhould never be applied without being firſt mixed with lime and earth to ferment and putrefy; or with earth to ferment and putrefy—when burnt, they yield an excellent

lent manure called kelp, containing vitrifiale earth, and a very ſtrong alkali; ſoluble in water, it acts as vegetable aſhes.

Weeds and offals of a garden or field, when burnt, produce alkaline ſalts and abſorbent earth; if not burnt, ſhould be mixed with the compoſt dunghill,—when the ſeeds of the weeds are formed, it is eſſentially neceſſary the weeds ſhould be burnt, to prevent their ſeeds from ripening, and being conveyed into the ground with the manure; as couch and ſome other weeds vegetate at every joint or knot, they likewiſe ſhould be burnt.

Of SHELLS *of* SEA FISH.

Shells of ſea fiſh and all others, are compoſed of calcarous earth and ſalts, when applied in their natural ſtate, continue a long time without diſſolving. When burnt, they make a ſtrong lime more efficacious than ſtone lime—and as great quantities of oyſter ſhells may be collected in the country, and the farmer can burn them with a trifling expence, it will make a cheap and laſting manure for clayey and loamy ſoils.

Of

Of CHALK.

Chalk is an abſorbent earth, containing neither oil or ſalts; but when incorporated with the earth it attracts acids, oils and ſalts, thereby enriching the ſoil; but as chalk doth not abound ſo plentifully in this country as it does in others, I ſhall not treat ſo largely on it as otherwiſe I ſhould.

OF MARLE.

Marle is compoſed of lime, clay and ſand; is increaſed in value according to the quantity of lime it contains, and is beſt adapted for ſands and light ſoils. The quantity is from forty to eighty loads per acre, in proportion to the lightneſs of the land.

OF BRICK AND LIME RUBBISH.

Brick and lime rubbiſh are good manures for cold arable lands; are abſorbents, and lighten the ſoils.

OF

Of SAW DUST, TANNERS BARK, &c.

Saw duſt, tanners bark and rotten leaves are beſt for the compoſt dunghill; as well as the apple pulp, after being preſt for cyder; therefore ſhould be carried into the farm yard, as it is good for all ſoils.

Of ANT HILLS.

Ants are evidently known to be very injurious to lands, particularly paſtures, and great deſtroyers of fruit. Obſervations inſtruct me that they multiply and increaſe moſt in cold, clayey, or ſuch other ſoils as contain the greateſt acidity; the hills they raiſe, produce but a very ſmall quantity of ſuch coarſe graſs, as no animal chooſe to eat. The longer theſe hills are permitted to remain on the ſoil, the more they are extended over the ſurface, and increaſe in number. Hence, the ground they occupy is ſo much land loſt to the farmer; and on lands that are mowed, theſe hills and hillocks quickly blunt the edge of the mower's ſcythe. The heavy falls of autumnal rains that ſaturate the earth, oblige theſe ſagacious but injurious inſects to aſcend from

from under the ſurface of the ground, into a higher ſituation in their manſions, which are moſt conveniently conſtructed for their reſidence and defence from rains.—The vernal heat of the ſun does alſo influence them to occupy their upper appartments ; theſe are the ſeaſons beſt adapted for their deſtruction.

In the months of November or December, when the earth is frequently filled with water, their hills ſhould be pared off lower than the ſurface, and carried into the farm yard to the compoſt dunghill, or mixed with lime, where the eggs and inſects will be converted into a rich manure. Should any of the ants remain, the rain and froſt will deſtroy them, or ſow ſome freſh ſlacked lime over, which will effectually deſtroy them and ſoon produce a ſweet herbage.

In the months of April or May, as the heat increaſes, theſe inſects are alſo influenced to aſcend their upper apartments, for to enjoy the ſun's enlivening powers; at ſuch ſeaſons, they and their hills ſhould be cut, carried off, and managed as before directed. The bare ſpots ſhould be ſowed with graſs ſeeds and white clover, raked in, which will ſoon vegetate.

Three advantages result from such conduct; the land is made even, the insects are destroyed, and a rich addition, far superior to common earth, is procured for the compost dung-hill.

Of WOOLEN RAGS, &c.

Woolen rags, cuttings of leather, particularly the refuse of skinners and tanners yards; with hair, and bones ground or powdered, are exceeding good manures, containing mucilage, oils, and alkaline salts, and will suit all sorts of lands.

Of DEAD ANIMALS.

Dead animals should be buried in the dung-hill, where they will putrify, and greatly enrich it; they contain oil and salts.

Of URINE.

Human and animal urine are composed of water, oil and salt. Human urine should be carefully preserved in casks or tubs, and if not

not uſed by itſelf as a manure, ſhould be thrown on the dunghill. All kinds of urine, when recently applied, are very acrid, and rather hurtful to vegetation. When ſtale, their acrid properties are corrected by fermentation, and then they contribute greatly to fertilization.

Stale urine, and the draining from the dunghill, are greatly preferable to dung for fruit trees, as penetrating better to their roots, and not harboring inſects; whereas dung ſecretes worms and inſects, that are conveyed to the roots of the trees with the dung, which mixed with the mould undergo a ſecond fermentation; and thereby the worms and inſects acquire ſuch ſtrength, as to make the tender roots and fibres of the trees part of their food.—Hence trees being deprived of a great part of their grand reſources, (which are conveyed to them through the pores or mouths of every root and fibre) become diſeaſed, and frequently die. Another diſadvantage attends the application of dung and dead animals to the roots of trees; theſe manures are very improper, as they harbour worms and inſects, that attract moles and other vermin, which do much injury, by breaking the roots and tender fibres of the plants, and by making hollow paſſages, which

admit the cold air and frosts in winter, and the scorching heat in summer. Hence trees and plants become sickly, and are rendered incapable of producing luxuriant crops.

Human urine is the richest, as containing more salts and oil than any other. As great quantities may be collected in cities and large towns, it should be kept in casks to ferment; and if mixed, when stale with piles of earth, it will form an excellent compost, far superior to dung. Stale urine, applied by watering pots, over the trenched garden grounds, after being levelled in the spring, will kill worms and insects, and prove an exceeding rich manure.

Of SOAP SUDS, &c.

Soap suds, and soap maker's ashes, is composed of vegetable or animal oil, alkaline salts and lime, by which their original textures are altered and become so combined, as to be easily rendered miscible by water. Hence soap suds and soap maker's ashes are excellent manures for all sorts of vegetables and fruit trees.

Of

Of MALT DUST.

Malt duſt is an exceeding good top dreſſing for corn and meadows in the ſpring. Dung and other manures plowed in, looſen and divide the ſoil, and are beneficial to ſucceeding crops. Whereas, top dreſſing, (excepting the alkaline manure) principally nouriſh the plants, and ſupply food for thoſe crops only on which they are laid, without looſening or dividing the ſoils, or being beneficial to ſucceeding ones. From twenty to forty buſhels per acre, (according to the richneſs or poverty of the ſoil) is the moſt advantageous. When too great a quantity of malt duſt is applied to grain, the ſtraw grows ſo luxuriantly, as to be beaten down and laid by high winds and heavy rains.

Of A NEW, CHEAP AND EFFECTUAL ALKALINE MANURE.

Lands adjoining cities and large towns, may be manured on very reaſonable terms; and according to the diſtance, ſo in proportion

malt dust = polvo que deja de la cebada al molerla para hacer la cerveza; muy bueno como abono
corn = grano para sembrar

on is the expence of carriage increaſed. Lands ſituated in the interior parts of the country, are in general manured only with the dung ariſing from the cattle and ſheep folded on the grounds; the quantities thus obtained, are very inſufficient for the purpoſes of proſecuting an advantageous cultivation.

All or moſt countries produce either wood, goſs, heath or peat, frequently called turf, which are uſed for firing; their aſhes are thrown (from a want of knowing their real value) into ſome open place, where they are expoſed to rains, which waſh away their ſalts and fertilizing properties. The great advantages of manures, particularly when the diſtance is too far to procure them from cities and towns, muſt be too obvious to the diſcerning agriculturiſt, to require any comment.

The alkaline and new manure, which I have experienced to be inferior to none, I have made as often as I could procure materials, in the following manner, viz. Having collected from the ſide of ditches, and from commons, a quantity of bruſh and rubbiſh wood, briars, thorns, &c. ſtems and roots of weeds, ſtalks of beans, corn, and garden of-

falls

heath = brezo. peat = turba rubbish = escombro broza
ditch = zanja foso hoyo. briar = zarza.
thorn = espino bean = haba.
stem = vastago tallo offal = sobras desecho.

fals, which are burnt, and the aſhes ſifted; ſuch cinders as are not thoroughly conſumed, undergo the ſecond operation of the fire, are again ſifted, and immediately carried into the houſe to prevent the bad effects of rain; and to every four buſhels of aſhes, or in proportion, I add one buſhel of quick lime, on which is thrown as much ſtale urine or drainings from the dunghill, as will thoroughly ſlack it, when the whole is turned and mixed as often as is neceſſary, ſo that the lime and aſhes may be completely incorporated. The aſhes of all vegetables are vetrifiable, and frequently found to contain metallic particles. Quick or freſh burnt lime is freed from fixed air, its corroſive and acrimonious properties are ſo great, as to decompoſe metallic particles, as alſo to deprive alkalies of their fixed air, and diſunite their texture, by which their powers are ſo much encreaſed, as to be the more readily enabled to diſſolve oils, &c. for the purpoſe of making ſoap. Hence, in a ſimilar manner, they unite with, and diſſolve the oleaginous particles in the earth, by which the oils and ſalts are rendered miſcible with water, and thereby converted into a moſt nutritive food for vegetables. When lime is expoſed to the air (even in a houſe) it will abſorb moiſture, fall into a powder, attract fixed air, and by degrees loſe its corroſive and

and accrimonious powers. Aſhes alſo attract moiſture, &c. Hence, if the alkaline manure is not immediately uſed, it ſhould be carried into a loft or ſome dry place, well covered, and kept as cloſe as poſſible from the air, by which its virtues will be retained. If uſed as a top dreſſing for wheat, eight or ten buſhels per acre, ſowed in the months of November or December, when the manure will be ſoon waſhed into the earth, will nouriſh and keep warm the roots of the plants, kill inſects, and greatly fertilize the land for that and ſucceeding crops.

When applied to barley, it ſhould be ſown very early in the ſeaſon, for reaſons already given under the ſection of ſoot.

When applied for paſtures, the land ſhould be firſt harrowed with fine harrows, in the month of March or beginning of April, if the ſeaſon and weather ſuits, and from eight to twelve buſhels per acre, regularly ſowed over.

The harrows will looſen the ſoil, admit the air and manure to the roots of the graſs; their effects will ſoon become viſible, and continue for ſome years.

When

When applied for a compoſt, twenty buſhels or more to an acre (according to the nature of the ſoil) may be mixed and thoroughly incorporated with ſixty buſhels of earth to an acre, and applied in the ſame manner as lime.

Sea ſhores produce great quantities of weeds, which when burnt, become a ſolid ſubſtance called kelp, containing ſtrong alkaline ſalts.

Such aſhes, pulverized, ſifted and mixed with lime, in the ſame manner as wood aſhes, muſt prove more efficacious; as kelp contains a much greater proportion of alkaline ſalts, than the ſame weight of wood aſhes; ſo in proportion, a leſs quantity will ſuffice.

As the properties of kelp are very corroſive, it ſhould be firſt mixed with lime, then with earth in a compoſt, in preference to its being applied alone, and ſhould be kept in a dry place ſome weeks before it is uſed.

When wood, weeds, &c. are burnt in the open air, the volatile ſalts, oils, and part of the

the calcarious earth, aſcend in the form of ſmoak, into the atmoſphere.

Where large quantities of rubbiſh, wood, weeds, &c. can be procured, a ſmall building, ſixteen feet long, twelve feet broad, and twelve feet high, or of any other ſize in proportion, covered with an arch or dome, with a high and narrow chimney, might be erected at a very inconſiderable expence. The rubbiſh wood, &c. ſhould be burnt therein; the volatile particles and calcarious earth would be preſerved on the dome and walls, in the form of ſoot, the aſhes would be kept dry, and the agriculturiſt would in a ſhort time, be fully repaid ſuch expences.

OF NATURAL PHILOSOPHY.

Natural philoſophy is the knowledge or ſtudy of natural productions founded on reaſon and experience. By ſtudying the qualities of natural bodies, in relation to their generation, motion, or other properties, the wonderful works of the creation are diſcovered to our view, that we may with cheerful and divine contemplation, ſenſibly feel and gratefully acknowledge the myſterious works of Providence.

God

God beſtowed upon man the earth, that he might employ his time by labour, and underſtanding, in repleniſhing and ſubduing it.

By labour, to cultivate the ground; ſuch employment makes him ſtrong, active and healthy.

By underſtanding, to ſtudy the moſt beneficial methods of repleniſhing and applying ſuch manures as are moſt effectual for ſubduing and correcting its coheſive and injurious particles; that he may, by his induſtry and knowledge, be beſt enabled to ſupply the wants of nature.

Providence moſt wonderfully aſſiſts the induſtry of man, by celeſtial and atmoſpherical influences, which greatly tend to enrich the earth, and to promote vegetation.

Of the SUN.

The ſun is the principal ſource of heat, as well as light, without which, all bodies would become rigid, lifeleſs and fixed. Hence, animalization and vegetation are pro-

moted, and the ocean and atmoſphere continue in a fluid ſtate.

Heat contributes materially to promote the growth of plants; vibrates the parts of bodies; excites and promotes a motion in the fluids; reſolves the watry and oily particles of the earth into vapour; rarifies the juices of vegetables; exhales the putrid, volatilized, ſulphurious, ſaline and inflammable particles from dunghills, other corrupted bodies, and from ſmoak. Part is abſorbed by vegetables which add to their increaſe: the remainder aſcend and float in the atmoſphere, where being combined, are formed into a ſaline ſubtle oil, which by the ſummer ſhowers and dews, are converted into nutriment, returned into the earth, and abſorbed by the leaves and roots of plants.

The life and growth of animals and vegetables, depend on a certain degree of heat, which every year confirms. As the heat decreaſes in the fall, ſo in proportion, vegetables looſe their verdure. And as the ſun's enlivening powers return in the ſucceeding ſpring, every plant will earlier or later reſuſcitate, and accordingly grow to maturity.

Exceſſive

Exceſſive heat without moiſture, is injurious to vegetation ; as more nouriſhment is exaled from the earth and plants, than is returned by that condenſed vapour which falls in the form of dew.

By a defect of heat, the circulation of the ſap becomes languid,and ceaſes; and according to the continuation of the cold drying winds, (without the intervention of rain or dew) ſo proportionable is the perſpiration and circulation or motion of the juices ſtopped in the tender leaves, bloſſoms, and branches ; the perſpiring matter thereby adhering to the external part, are converted into a mucilage that harbours inſects (which are the effects, but not the cauſe of blights,) ſimilar to all corrupted animal bodies, which naturally ſecrete worms.

It frequently happens that one part of a tree is ſuddenly ſcorched and ſhrivelled by a ſharp hoary froſt or cold wind, which ſtops the weak motion of its juices ; while the other part appears healthy and in full verdure. Such effects ariſe from inward weakneſs, the want of ſufficient moiſture or nouriſhment, or from ſome bad quality in the ſoil or ſtock.

Soap

Soap ſuds, ſtale urine, or the drainings from the dunghill, applied to the roots of trees after the earth has been dug or looſened, inſtead of ſecreting and nouriſhing, deſtroys worms and inſects; keep the roots of trees warm in winter; and by their ſaline and oily particles, attract and retain moiſture in ſummer; —hence are the moſt effectual preſervatives againſt blights and other diſeaſes. In wet ſeaſons theſe manures may be freely uſed, as the rains will ſufficiently correct them when too ſtrong; but in dry weather they ſhould be properly diluted with water.

Of FROST.

Froſt is the moſt ſevere effect of cold, but a great fertilizer of land, particularly all ſtiff and clayey ſoils. It anſwers ſeveral purpoſes; it locks up the ſurface of the earth, prevents the carrying off that ſubſtance neceſſary for vegetation, checks the growth of weeds, prevents the hatching of inſects, and deſtroys them, lightens the earth, expands the moiſture and breaks down the texture of the ſoil into the moſt minute particles.

White

White froſt is no more than dew frozen, which does not injure vegetables materially.

Of HAIL.

Hail is drops of rain frozen in their paſſage through the atmoſphere. The greater the height they deſcend from, the greater is the reſiſtence they meet with from the air, the more globular and the ſmaller is the hail. Hence, vice verſa, the leſs the height of their deſcent, the leſs is the reſiſtence they meet with in the air; of courſe, the leſs globular and the larger is the hail. It is very hurtful to vegetation, by beating the farina or bloſſoms off the corn or trees.

Of SNOW.

Snow, is a meteor engendered in the air by moiſture and cold; contains no nitre nor any other ſalts, leaves nothing that chryſtalizes after diſſolution; but contains inflammable matter, and makes the common air more noxious and unwholeſome than before.

Snow

Snow fertilizes the ground, by preventing the eſcape of what nouriſhes plants, protects corn and other vegetables from the intenſer cold air, and piercing winds, and keeps their roots warm.

Of LIGHTNING.

Lightning is a mixture of ſulphurious and nitrous effluvia, which ferment, kindle, and occaſion thoſe exploſions and vivid flames of fire, which we call thunder and lightning; and is in the hand of Providence in ſome reſpect ſimilar to what electricity is in ours.

Lightning does much more good than hurt to vegetation; it frees the atmoſphere from ſulphurious and other noxious particles, and produces cold. Hence, the watry vapours floating in the air are condenced, and deſcend in the form of rain, which greatly fertilize the land.

Of D E W.

Dew is a compound of moiſture, oily, ſaline and volatile particles, exhaled by the heat of the ſun from the ſea, rivers, ſtanding waters,

waters, marſhy lands, the earth, dunghills and other putrid matters ; all which are attracted by the wonderful power of the ſolar rays, and carried into the atmoſphere, where they float, are intimately united, and kept in agitation by the heat of the ſun, and become inviſible ; but when the ſolar heat begins to remit, and as the air cools, the watry compound particles are condenſed, and fall upon the earth and leaves of vegetables. The ſtronger the heat of the ſun, the greater is the exhalation and fall of dew at night.

As the ſun aſcends above the horizon in the ſummer, the exhalation, particularly of ſtanding waters and marſhy lands, is extremely viſible.

In the drieſt and warmeſt ſeaſons, when the earth is parched and dried up, then Providence moſt wonderfully aſſiſts and promotes vegetation, by the fall of dews on the leaves of trees, and vegetables: as the heat of the ſun increaſes, it excites and promotes a motion in the juices, the leaves imbibe the fertile pearly drops, and convey them through the veſſels, by which vegetables are nouriſhed.

marshy = pantanoso
to parch = secarse ó tostarse

Of

Of CLOUDS.

Clouds are a collection of vapours exaled from the ſea, other waters, and from the land, by the ſun or ſubterraneous heat, or both, which when exhaled, are too ſmall to be perceived; but when they aſcend into that region of the atmoſphere of the ſame ſpecific levity, there they float, are driven together by the agitation of the winds, condenſed by the cold, and rendered opake by the union of their parts. Hence, they viſibly appear in the form of clouds, which, being heavier than the air, of courſe fall thro' it; and according to the height they deſcend from, and the reſiſtence they meet with from the atmoſphere, are broken and divided into proportionable ſmall drops, called rain.

Of RAIN.

Rain is a precipitated cloud, broken and divided into innumerable drops. The greater the height they deſcend from, the greater is the reſiſtance they meet with from the air, the more are they divided, and leſſer are the drops of rain. Hence, vice verſa, the leſs the

the height of their deſcent, the leſſer is the reſiſtence they meet with in the air, of courſe the larger are the drops of rain.

Vegetables cannot grow without water. Rain promotes vegetation, by furniſhing ſalts and oils from the atmoſphere, by diſſolving and uniting the oily and ſaline particles in the earth, by expanding the imbibing veſſels, by attenuating the glutinous ſubſtances, by promoting the inteſtine motion of the juices, by looſening the earth, that the roots of plants may enjoy acceſs of air, and be better enabled to extend themſelves in ſearch of thoſe nutritive particles, conveyed to them, by means of heat and that moſt uſeful watry menſtruum.

Exceſs of rain is hurtful to vegetation, particularly when waters remain any conſiderable time on the ground, which leſſen the warmth in the earth, and thereby prevent vegetation; or deſtroy the roots of plants, and render ſuch places barren; or produce ſuch rank unwholeſome weeds as are nouriſhed by ſtagnated waters, which become putrid by the heat of the ſun.

Too much moiſture yields a thin vitiated food, prevents the acceſs of air to the roots of

 plants,

plants, impedes their natural growth, and prevents their ſeeds from being perfected.

If heavy rains fall when the plants are in bloom, their farina is waſhed off, and conſequently there can be no impregnation. Hence, wet ſeaſons produce the ſmalleſt crops.

The want of rain is alſo hurtful to vegetation. Heat diſſipates the moiſture in the earth, which becomes too dry. Hence, it is baked and rent by the ſcorching rays of the ſun, which deſtroy the roots of the plants, or ſo harden the earth, as to prevent the fibres from extending themſelves in ſearch of food.

Of AIR.

Air is a thin inviſible elaſtic vapour, imperceptible to all our ſenſes, except of feeling.

The colder the weather, the more is the air condenſed, whereby the heat of the fires are

are more confined, and become ſtronger in winter than in ſummer.

When water is converted into vapour by diſtillation or exalation, the water becomes lighter than the air. Hence, watry vapours are raiſed to a conſiderable height, and float in the atmoſphere, where its weight, denſity, and preſſure, is leſs than near the ſurface of the earth.

Moiſt vapours leſſen the elaſticity of the air, becauſe the force of repulſion in the particles of watry vapours, is leſs than in the particles of air.

A moiſt atmoſphere is heavier than a dry and clear atmoſphere, in proportion to the quantity of ſuſpended watry particles; and according to its component parts, its weight varies, which barometers diſcover.

The elaſticity of air is increaſed by heat, and decreaſed by cold.—Hence appears the uſe of thermometers, which indicate the various degrees of both.

Air is abſolutely neceſſary for the ſupport of animal and vegetable life; without it there could be no exiſtence, which experiments with

with air-pumps ſufficiently demonſtrate. No ſeed can vegetate nor vegetable grow in any place deprived of air.

Freſh air is impregnated with a particular vivifying ſpirit, eſſentially neceſſary to the preſervation of animal life.

Every time the air paſſes out of the lungs, part of the vivifying ſpirit is either deſtroyed or left behind.—Hence, animals die when confined in noxious air, as well as from the want of it.

Air is changed by the corruption and putrefaction of the vivifying ſpirit: as the properties of things putrefied are different from the properties they contained before putrefaction; ſo, in proportion, is the health of animals affected. Hence ariſe epidemical diſeaſes amongſt the inhabitants and animals of ſuch countries as are marſhy, and are ſurrounded or interſected with ſtagnated waters, which of courſe putrefy and deſtroy the vivifying ſpirit in that air.

The different effluvias diffuſed through the air, produce a variety of different effects. In all large cities, the air abounds with ſulphurious, acrid, and corroſive particles, which ruſt

ruſt metals ſooner than in the country; and near mines of copper, its effects are ſo great as to diſcolour ſilver and braſs. W Howe.

Air not only acts upon all bodies by its common properties of weight and elaſticity; but alſo by the peculiar qualities of the ingredients whereof it is compoſed, greatly promotes vegetation; for the more vegetables enjoy the free acceſs of air, (not only to their leaves, ſtalks and branches, but alſo to their roots) the more they grow and thrive; ſuch is the vivifying power of air, that it was conſidered by the ancient philoſophers as the firſt principle of all things.

As the learned and ingenious Dr. Hunter, of York, in Great-Britain, firſt made thoſe important and intereſting diſcoveries, relative to the putrid and noxious particles of the air being conſumed by the vegetable creation, and which were publiſhed in the year 1769, and 1770, I will beg leave to preſent the reader with ſuch extracts as are neceſſary for my preſent ſubject.

" It is pleaſing to obſerve how the diſſolution of one body is neceſſary for the life and increaſe of another. All nature is in motion. In conſequence of the putrid fermentation

tion

Weight = per.
to thrive = nectar.

tion which is every where carried on, a quantity of vegetable nutriment aſcends into the atmoſphere—ſummer ſhowers return much of it again ; but part falls into the ſea and is loſt : to this we may add the animal and vegetable ſubſtances conſumed on board of ſhips, all of which are buried in the ocean. The induſtry of man reſtores them to the earth ; and we may preſume that the fiſh taken out of the ſea, leaves a ballance in favour of mankind. Thus Providence with the moſt conſummate wiſdom, keeps up the neceſſary rotation of things."

" Hitherto I have conſidered plants as nouriſhed by their roots. I ſhall now take a view of them as nouriſhed by their leaves. An attention to this part of the vegetable ſyſtem, is eſſentially neceſſary to the rational farmer. Vegetables that have a ſucculent leaf, ſuch as vetches, peas, beans, and buckwheat, draw a great part of their nourihment from the air, and on that account, impoveriſh the ſoil leſs than wheat, oats, barley or rye, the leaves of which are of a firmer texture. Rape and hemp are oil-bearing plants, conſequently impoveriſhers of the ſoils ; but the former leſs ſo than the latter, owing to the great ſucculency of its leaf. The leaves of all kinds of grain are ſucculent for a time; during which period the

the plants take little from the earth; but as ſoon as the ear begins to be formed, they loſe their ſoftneſs, and diminiſh in their attractive power. The radical fibres are then more vigorouſly employed in extracting the oily particles of the earth, for the nouriſhment of the ſeed. Such I apprehend is the courſe of nature."

"In order that we may have a diſtinct view of the motion of the ſap, it will be neceſſary to reflect that the root, ſtem, branches and leaves are conſtructed in the ſame manner. Sallows, willows, vines, and moſt ſhrubs, will grow in an inverted ſtate, with their tops downwards in the earth. Dr. Bradly deſcribes the manner of inverting a young cherry tree, the roots of which will put forth leaves, and the branches become roots. Hence it is obvious that the nutritive matter may be conveyed as well by the leaves as the roots, their vaſcular ſtructure being the very ſame.

"Air is to be found in every portion of earth: and as it always contains a ſolution of the volatile parts of animal and vegetable ſubſtances, we ſhould be careful to keep our ſtiff ſoils as open as poſſible to its influence. It paſſes both in its active and fixed ſtate, into

into the abſorbent veſſels of the root, and mixing with the juices of the plant, circulates through every part. Dr. Hales, in his ſtatical experiments on the vine, diſcovered it aſcending with the ſap in the bleeding ſeaſon."

In the year 1773, the ingenious and indefatigable Dr. Prieſtly, preſented to the royal ſociety, his experiments on the different kinds of air, which clearly proves that putrid air ariſing from dunghills, and that the perſpiration of animals, are not only abſorbed by vegetables, but alſo add to their increaſe. As thoſe experiments are of too intereſting a nature to be paſſed over unnoticed, for the benefit of thoſe who have not had an opportunity of ſeeing the original, I ſhall here tranſcribe part, referring the curious to the learned Doctor's publication.

" When air has been freſhly and ſtrongly tainted with putrefaction, ſo as to ſmell thro' the water, ſpriggs of mint have preſently died, upon being put into it, their leaves turning black; but if they do not die preſently, they thrive in a moſt ſurprizing manner. ...

" In no other circumſtances have I ever ſeen vegetation ſo vigourous as in this kind of

air,

to bleed = sangrar   to smell = oler
to taint = tinturar impregnar   mint = menta ...
sprig = ramito
to thrive = medrar prosperar   jar = jarro, choque.
to breath = respirar vivir

air, which is immediately fatal to animal life. Though theſe plants have been crouded in jars filled with this air, every leaf has been full of life; freſh ſhoots have branched out in various directions, and have grown much faſter than other ſimilar plants, growing in the ſame expoſure in common air. This obſervation led me to conclude, that plants inſtead of affecting the air in the ſame manner with animal reſpiration, reverſe the effects of breathing, and tend to keep the atmoſphere ſweet and wholeſome, when it is become noxious, in conſequence of animals either living and breathing, or dying and putrefying in it.

" In order to aſcertain this, I took a quantity of air, made thoroughly noxious by mice breathing and dying in it, and divided it into two parts; one of which I put into a phial immerſed in water; and to the other (which was contained in a glaſs jar ſtanding in water) I put a ſprig of mint. This was about the beginning of Auguſt, 1771, and after eight or nine days, I found that a mouſe lived perfectly well in that part of the air, in which the ſprig of mint had grown, but died, the moment it was put into the other part of the ſame original quantity of air, and which I had kept in the very ſame expoſure, but

mouse, mice (plural) rather.

without any plant growing in it.—This experiment I have ſeveral times repeated, ſometimes uſing air in which animals had breathed and died; ſometimes uſing air tainted with vegetable or animal putrefactions, and generally with the ſame ſucceſs.

On the IMPROVEMENT *of* WET LANDS.

The firſt and principal improvement of wet land is draining, without which, the greateſt quantity of the beſt manure will prove ineffectual. Coarſe graſs, ruſhes, horſe-mints, and other noxious weeds, are the general productions of lands overcharged with moiſture, proceeding from the water being retained by a ſtiff impervious clay, or from cold hungry ſprings, which are frequently loaded with minerals and acids; and from want of proper drains, the ſtagnated waters corrupt the natural nouriſhment, ſo eſſentially neceſſary for producing ſweet herbage; but when the cauſe is removed, the effects will ceaſe. Thoſe luxurious, noxious weeds being deprived of their nouriſhment, of courſe die, and ſweet wholeſome herbage naturally ſucceed, without manure.

The

to breath = respirar.
To drain = desaguar secar
spring = manantial. primavera
rush = junco.
horsemint = mastranzo

The greateſt attention ſhould be paid to the ſituation and declivity of the ground; the ditches at the loweſt part of the land ſhould be firſt opened of a ſufficient depth and ſize, (according to the nature of the ſoil) at leaſt three feet perpendicularly deep, two feet wide at the bottom, and four feet wide at the top, gradually increaſing from the bottom to the ſurface; which ſlope will prevent the ſides from falling in with rain or froſts. The mould thrown from this ditch or drain will make a bank on one ſide, on the top, a dwarf hedge may be made with ſome bruſhwood at a very trifling expence, that will be ſuperior to a poſt and rail fence—lands by that means may be put into ſmall lots, which will be of great advantage to the farmer. Directions for making the hedge, I ſhall give hereafter—ſee hedging.

Small or leading drains ſhould be made (according to their declivity) from twenty to twenty four inches deep, nine inches wide at bottom, and from fifteen to eighteen inches broad on the ſurface; extending through the moſt hollow, and from the loweſt to the higheſt parts of the land. Theſe branches or ſmaller drains ſhould be from twenty to forty or fifty feet apart (in proportion to the ſprings and wetneſs of the ſoil) cut acroſs the ground, with

a hanging

slope = sesgo declive
dwarf = enano. hedge = seto vallado
fence = defensa cerca hollow = hueco cavidad
rail = baranda balaustrado across = de través

a hanging level, ſufficient to convey the water into the large drains.

If ſtones can be conveniently got, they are the moſt effectual for this purpoſe: when the work is properly executed it will laſt for ever. The beſt method I have experienced is, to place flat ſtones ſtanding on the bottom as perpendicular as the ſides of the drains will admit, with other flat ſtones on the oppoſite ſide, placed with the top part toreſt againſt the upright ſtones, in the form of  ſhould this cavity be inſufficient for the current of water, another flat ſtone may be placed in a reverſed form, as  by which there will be a double vacuum, fully ſufficient for the greateſt current; the remainder of the drains, when in arable lands, may be filled up with ſtones, to within about eight inches of the ſurface, covered with ſtraw or ſtalks of any ſort, to prevent the earth from falling between the ſtones, and filled up with the mould that came out of the drain; the remainder may be ſcattered over the land.

In draining paſture lands, the turf is carefully laid aſide, the drains filled with ſtones to within four or five inches of the ſurface; and the graſs part of the turf is placed there-

flat-lane plane

on, which ſaves the trouble of laying ſtraw, and as effectually prevents the earth from falling between the ſtones into the drains.

The effects of draining are too obvious to require any comment.

Of CLEARING LAND *from* TREES, &c.

The next improvement is, the clearing of lands from the ſtumps and roots of trees, grubbs, thorns, briers, &c.

When lands are encumbered by any of thoſe before mentioned, it is impoſſible to plow land as it ought to be—when land is only ſcratched, and theſe rubbiſh receiving part of the nutritive food, good crops cannot be expected.

Timber and pollard trees are injurious to arable and paſture grounds; they obſtruct the free circulation of the air and the effects of the ſun. The leaves, particularly of aſh, render the graſs, whereon they fall, coarſe and ſour; which, when eaten by cows, affect their milk with a ſtrong diſagreeable taſte.

Trees

Trees attract, and their ſhade and roots retain moiſture and acidity in the ſoil; their wide extended fibrous roots, particularly of aſh and hickory ſtrike horizontally, near the ſurface, to a very conſiderable diſtance; they greatly impoveriſh paſture grounds, and impede the plow in arable land.

The roots of trees grow in proportion to their trunks and branches; therefore, no more than two or three ſhould be left in a field for cattle to rub againſt, and for ſhade.

When trees are planted, or permitted to remain for timber or for firing, the northern and eaſtern ſides of fields, and irregular corners, are the moſt proper ſituations; where they afford ſhelter, and ſerve as a ſcreen againſt cold winds, and do not obſtruct the influences of the ſun and air.

When lands are cleared from ſuperfluous trees, &c. attention ſhould be paid to the ſurface and condition of the ground—where ants inhabit, their hills ſhould be pared off as before directed, carried to the middle of the field, and there mixed with the aſhes made from the rubbiſh wood, &c. and lime, when thoroughly

shade = sombra. to strike = herir golpear. [illegible]
timber = madera
to rub = estregar. limpiar.
screen = mampara criba
shelter = guarida amparo.

thoroughly incorporated, it muſt be ſpread over the ground equally.

By placing the manure in the middle, it is the ſooner, and at leſs expence carried over. But ſhould there be any uneven land or banks, ſuch ſhould be plowed and harrowed, the pared hills ſhould be depoſited thereon and levelled, the aſhes and lime ſhould be laid on the middle of the bank, and as ſoon as the lime is ſlacked, it ſhould immediately be mixed with the ant hills, aſhes, and earth; and when well incorporated, ſhould be applied in proportion as before.

Plowing of ground is of ſuch abſolute neceſſity in all lands where grain and artificial graſſes are ſown, that whoever is wanting in this work, to get the earth into a fine, hollow ſweet condition when the grain is ſown, may depend their crop will fall very ſhort: and as I conceive, the neglect of that moſt uſeful and neceſſary part of huſbandry in this country, to be one of the principal cauſes of the produce not to be equal to that of other countries, I ſhall be very particular in laying down the different methods I have uſed, as well as quote different authors: I ſhall firſt give

uneven = desigual. to pare = recortar
to level = igualar nivelar

give a deſcripion of the different ploughs uſed in ſeveral counties in England.

The plough moſt uſed in Middleſex, Hertford, Berkſhire, Bedfordſhire, &c. is the two wheeled plough—as I have not ſeen one of them in this country, I ſhall give a deſcription of it.

The two principal parts of this plough, are the head and the tail; the plough head contains the two wheels and their axis or ſpindle paſſing through a box, and turning round in it, and in the wheels; there are fixed perpendicularly in this box two crow ſtaves, as they are called, which are flat and narrow boards, each having on it two rows of holes, whereby to raiſe or ſink the beam of the plough, by pinning up or down the pillow, to increaſe or diminiſh the depth of the furrow.

Behind are a pair of gallows, through which the crow-ſtaves paſs at the top by mortiſes, into which they are pinned, and to theſe are faſtened what they call the wilds, which are rings and crooks of iron by which the whole plough is drawn in the working.

From the box to the centre of the beam, there is carried an iron chain, conſiſting of four

four, five or more long links, and called the tow-chain: this faſtens the plough-tail to the plough-head.

It is fixed to an iron collar, faſtened in the beam at one end, and at the other paſſes through a hole in the middle of the box, and is pinned in with a wooden pin.

From the ſame iron collar to which the tow-chain is fixed, there is alſo another chain faſtened, called the bridle-chain: this runs above the beam, as the tow-chain does below it, and is compoſed of ſmaller and more numerous links.

At the upper end, as the tow-chain enters the box of the plough there is a perpendicular ſtick, carried up parallel with the left crow-ſtaff, and pretty near it, and faſtened to it by a withe, or rope, or by the end of the bridle-chain itſelf, when that is long enough. This ſtake is alſo faſtened in its lower part, under the gallows, to the ſame crow-ſtaff, by another withe or piece of rope.

Thoſe are the parts of which the head part of the plough is compoſed. The plough-tail conſiſts of the beam carried from the head

head to the very extremity, and ſerving as the ſupport and baſe of all the reſt.

A little below the collar to which the tow-chain and bridle-chain are faſtened, this beam is pierced with a large hole, which lets through the coulter: this is long and narrow, terminating in an edge, and reaching juſt to the ſhare; and it is fixed immoveable in its place by a wedge, which is driven into the hole of the beam with it: the office of this coulter is to cut the earth as it is thrown up by the ſhare.

Behind theſe, the ſame beam is pierced with two more holes, one very near its end: theſe give paſſage to two ablong pieces, called the fore-ſheat and hinder-ſheat, by which the plough-ſhare is ſupported in its place.

To the top of the hinder-ſheat there is faſtened a ſhort handle by a wooden pin.

Parallel to the hinder-ſheat, there runs up a piece of wood of much the ſame form, called the drock; and to this is faſtened another horizontal piece, called the ground-wriſt; theſe are all on the right hand ſide of the plough, and parallel with the fore-ſheat.

There

There runs another piece of much the ſame form with it, on the right hand; and the bottom of this is the earth-board. The long handle of this, which reaches as far as that of the ſheat, is faſtened to the drock, by a pin, the other end of which goes into the beam.

Near the lower end of the fore-ſheat, there are two flat pieces of iron, which paſs from the two ſides of it up to the beam; and being let through, are faſtened to the upper part by ſcrews and pins.——Theſe keep the ſheat in its place.

The ſtructure of the four-coultered plough, is different, in ſome reſpects to this, though in general founded on it. Its beam is ten feet long, whereas that of the common plough is but eight. The beam is ſtraight in the common plough; but in this it is arched in one fourth part of its length, near the plough-head.

At the diſtance of three feet four inches from the end of the beam at the plough-tail, the firſt coulter, or that next the ſhare, is let through; and at thirteen inches from this, a ſecond coulter is let through; a third at the ſame diſtance from that; and finally, the

the fourth at the ſame diſtance from the third, that is thirteen inches.

The crookedneſs of the upper part of the beam in this plough is contrived to avoid the two great length of the three foremoſt coulters, which would be too much, if the beam was ſtraight all the way; and they would be apt to bend and be diſplaced, unleſs they were vaſtly heavy and clumſy. Aſh is the beſt wood to make the beam of, it being ſufficiently ſtrong and yet light.

The ſheat in this plough is to be ſeven inches broad. The fixing of the ſhare in this, as well as in the common plough, is the niceſt part, and requires the utmoſt art of the maker; for the well going of the plough wholly depends upon the placing this. Suppoſing the axis of the beam, and the left ſide of the ſhare, to be horizontal, they muſt never be ſet parallel to each other; for if they are, the tail of the ſhare, bearing againſt the trench as much as the point, would cauſe the point to incline to the right hand, and it would be carried out of the ground into the furrow.

If the point of the ſhare ſhould be ſet ſo, that its ſide ſhould make an angle on the right ſide of the axis of the beam, this inconvenience

venience would be much greater; and if its point ſhould incline much to the left, and make too large an angle on that ſide with the axis of the beam, the plough would run quite to the left hand; and, if the holder, to prevent its running quite out of the ground, turns the upper part of this plough toward the left hand, the pin of the ſhare will riſe up and cut the furrow diagonally, leaving it half unplowed.

To avoid this, and ſeveral inconveniences, the ſtraight ſide of the ſhare muſt make an angle upon the left ſide of the beam; but that muſt be ſo very acute a one, that the tail of the ſhare may only preſs againſt the ſide of the trench than the point does.

The great thing to be taken care of, is the placing the four coulters: for on this the ſucceſs of the whole depends. Theſe muſt be ſo ſet that the four planes, as the plough moves forward, may be all parallel to each other, or very nearly ſo; for if any one of them ſhould be very much inclined to, or ſhould recede much from either of the other, then they would not enter the ground together.

In

In order to the placing them thus, the beam muſt be carefully pierced in a proper manner. The ſecond coulter-hole muſt be two inches and an half more on the right hand than the firſt: the third muſt be as much to the right of the ſecond; and the fourth the ſame meaſure to the right hand of the third: and this two inches and an half muſt be carefully meaſured from the centre of one hole to the centre of the other. Each of theſe holes is a mortiſe of an inch and quarter wide, and is three inches and an half long at the top, and three inches at the bottom. The two oppoſite ſides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the ſtanding of the coulter, which is wedged tight up to the poll.

The coulter is two feet eight inches long, before it is worn; the handle takes up ſixteen inches of this length, and is allowed thus long that the coulter may be driven down as the point wears away.

The ſingle wheel plough uſed in Eſſex, Suffolk, Norfolk, &c. is a fine light plough calculated for two horſes. The wheel is fixed to the beam by a piece of iron with holes in it, whereby it may be ſet near or off, deep and ſhallow

ſhallow. It has an iron earth-board made rounding, which turns the turf better than any other plough.

The ſingle wheel plough uſed in Surry, Kent, Suſſex, Hampſhire, &c. is a clumſy heavy plough, very wide in the breech, conſequently the draught of it muſt be very hard.

The ſwing plough uſed in Worceſterſhire, Glouceſterſhire, Warwickſhire, Northamptonſhire, &c. is much the ſame as that uſed in this country.

The hoe ploughs are two, one of them is that uſed in Eſſex, &c. only light, as it is often worked with one horſe, to plow between the rows of grain.—This is to go one bought, taking the mould away next the roots of the grain and throwing it up in a ridge in the middle of the alley.

The other plough has a ſhare with a fin on each ſide; it has two earth-boards, they are equal on both ſides, and made to let out to any weadth, or contracted in:—This plough is for going right in the middle of the alley between the grain, which throws up the mould equally up to the grain on both ſides,

and

and does as much work in half a bought as the other does in a whole one.

It is evident that earth often digged, and ſkreened in a garden, produces the beſt tillage; ſo is it the principal reaſon that plowing and harrowing of land makes it the moſt fruitful; for by this means the ſpirit of the earth, or the Sal. Terræ is collected, as alſo that of the air, dews, and rain; when ſeveral vegetable ſalts are put into a condition to act, by the fineneſs of the earth, which are the life and nouriſhment of all things that grow therein; and for the want of theſe two qualifications, many crops have been loſt. So that upon the due knowledge of plowing and the right practice thereof, depends chiefly the right benefit of farming. A light earth is capacitated to receive the nitrous dews and celeſtial influences, which coagulate and fix on the ſame; when a heavy ſour earth miſſes, and goes without the benefit.

And therefore I ſhall endeavour to ſupply in ſome meaſure, I believe I may ſay, what moſt authors have been hitherto chiefly wanting in; and the chief reaſon for their omiſſion, I preſume, is, their not being acquainted with the practical part of plowing, although

it

it is certainly the moſt neceſſary branch of farming.

When the ſoil has been well looſened by deep repeated plowings and harrowings, its particles are minutely divided, and the roots of plants have liberty to ſpread freely. Hence are enabled to acquire ſuch nouriſhment, as could not poſſible be obtained when confined between large impenetrable clods of earth.

Strong clayey ground cannot be too often plowed, and expoſed to the ſun and froſt. Gravels, ſands, and ſuch light grounds, are much ſooner brought into a tilth; therefore leſs plowings will do. All grounds ſhould be plowed as deep as the ſtaple will allow: therefore the two horſe farmers ſeldom cultivate the land as it ſhould be, becauſe their ſtrength renders them uncapable of doing this work to the purpoſe, ſo that the roots of large weeds are left, which ſhoot up with the grain and graſs, whereby is the occaſion of great part of the crop being loſt; for if only a poke root will ſet four horſes, what chance has a pair with ſtrong roots? It is therefore a farmer's intereſt to keep a horſe extraordinary.

When land is plowed well, and the weeds killed, then is there greater room for manures and dreſſings, which in weedy grounds help to multiply and enlarge their product, and often is the cauſe of ſuch weeds ſpoiling the crop.

PLOWING OF FALLOWS, OR FALLOWING,

Is preparing the land by plowing and manuring, recovering that ſpirit loſt in tillage; or ſweetening, and deſtroying thoſe particles hurtful to vegetation. Experience enables me to ſay, that ſummer fallows are unneceſſary on lands that can be brought into proper tillage for fallow crops.

The moſt attentive obſervations and experiments, have inſtructed me, that when paſtures are intended to be broken up, the latter part of September, or beginning of October, is the moſt advantageous ſeaſon. At that time vegetation begins to decline, conſequently the produce of the land is but of little value, till the ſucceeding ſpring.

The

The ground, as ſoon as broken up, ſhould be rolled with a heavy roller; the ſward by that means, will be ſo cloſed that the heat and moiſture will cauſe a ſpeedy fermentation, and rot the ſward more in October and November, than it would in the four following months. It ſhould be harrowed, that the earth may be looſened, and prepared to receive the benefits of the air, rain, and froſt.

The latter end of November, or the beginning of December, it ſhould be obliquely plowed as deep as the ſtaple will admit. By this mode, the baulks that were made at the firſt plowing will be corrected.

The land being thus left in its rough ſtate, will be expoſed to the winter froſt, which will penetrate the hard clods, and by its expanſive force, greatly aſſiſt in pulverizing the ſoil.

As ſoon as the weather will permit in the ſpring, it muſt be well worked with heavy harrows, by which the clods will be greatly, if not totally reduced; and by being thus divided, will receive farther benefit from the influences of the atmoſphere.

In the month of March, or April, according to the ſeaſon or climate, the land ſhould be again rolled, to break the remaining clods; which being preſſed into the ground, muſt be looſened and pulverized by harrowing. In this ſtate the earth ſhould remain for ſix or ſeven days, to receive further benefit from the atmoſphere. Then plow for the crop.

After the land has been prepared in this manner, I have ſown peas in drills at four feet diſtance—have given them two plowings with the hoe-ploughs, the produce per acre was ſeventy-five buſhels, which I ſold for 5s. 6d. ſterling. When the peas were off, I plowed it up, ſowed it with wheat in drills, at one foot diſtance, gave it two hand hoeings; the produce was fifty three buſhels, which I ſold for 7s. and 3d. pence ſterling; ſo that the produce in two years, fetched me 39l. 16s. 9d. per acre; from which deduct the expences, four plowings, at 8s. two rollings, at 1s. ſix harrowings at 1s. two buſhels of peas for ſeed, at 5s. 6d. one buſhel of wheat for do. 7s. 6d. drilling of the peas and wheat 4s. two years rent and taxes 2l. two horſe and two hand hoeings 1l. 4s. hooking, reaping and houſing 1l. 4s threſhing and carrying to market 1l. 10s. makes the

expences

expences 9l. os. 6d. which deduct from 39l. 16s. 9d. the ballance is 30l. 16s. 3d. being the clear profit per acre for two years.

This method of cultivation fully proves the great advantage of good tillage. The advantages ariſing from drilling in of grain are great, compared to the broad caſt.—By the drill, the ſeed is depoſited at ſuch a certain required regular diſtance and depth in the ground, as to meet with moiſture. Every ſeed will ſoon vegetate, and even in the drieſt ſeaſon will produce one extraordinary crop, from five to twenty buſhels per acre, more than by the common mode. The ſeed, by drilling is alſo ſecured from birds. The intervals admit being hoed and cleaned from weeds, while the ground is preparing for a ſucceeding crop, beſides by hoeing, the ground is ſo pulverized as readily to imbibe the dews and rains, keeps the pores open, ſo that in the drieſt ſeaſons plants are kept in a moiſt ſtate.

FALLOWING OF LAND THAT IS UNDER TILLAGE.

In order to illuſtrate the ſuperior advantages accruing from good management, thorough

rough tillage, and changing of crops, to improper management, and the erroneous ſavings of labour and expence, I ſhall revert to other of my experiments to prove the moſt beneficial method of culture.

After a field had produced its regular rotation of crops, I fallow plowed it, that is, as ſoon as harveſt was done, I plowed in the ſtubble and layed it up in one bout ridges, and let it lay in that rough ſtate, till the following ſpring; as ſoon as the weather would permit, gave it a good harrowing, which made the ſeeds of the weeds vegetate. In May obliquely plowed it; the latter end of June, gave it another good harrowing, then hauled on the manure, and ſpread it and plowed it in, and ſowed turnip-ſeed, broad caſt, every day what was plowed.

The ſeed was ſteeped in fiſh oil for twelve hours, which hinders the fly from hurting the plant. (In New-England, the beginning of July is the beſt ſeaſon for ſowing; in the middle ſtates, about the middle of the month; and to the ſouthward, the latter end.)

As ſoon as the plants were pretty large, before they bottled, I had them hoed, all the ſupurfluous ones cut up, and left at about

about fifteen inches apart. In October I gave them another hoeing: the two hoeings coſt me 10s. per acre. The latter part of November they were at their full growth, ſo large, that they covered partly all the ground.

This field contained ten acres, which I penned, and fed off with ſheep. I bought fifty weathers for 45l. and thirty ewes, with lamb, for 18l. The turnips were ſufficient for fattening the weathers, and cupples, excluſive of feeding ſixty ſtore ſheep, that followed thoſe that were fattening, and eat up their leavings. The weathers I ſold to the butcher for 112l. 10s. and the cupples for 57l. and the feed of the ſtore ſheep, I reckoned to be worth 9l. ſo that the profit of this fallow crop was 110l. 10s. which is 11l. 1s. per acre, excluſive of a good dreſſing from their manure, for a ſucceeding crop.

The following ſpring, I gave this field two plowings, the firſt as ſhallow as poſſible, the ſecond obliquely deeper, which turned up the ſheeps dung. I then harrowed it as flat as poſſible, to lay it even fit for mowing. I then ſowed it with ſpring barley, pretty thick in the drills, at a foot diſtance in the rows, which took ſix pecks to the acre, and

ſowed,

ſowed, broad caſt, at the rate of ſix pounds of clover, and four pounds of trefoil ſeed per acre, and harrowed it in at once with light harrows.

This method of ſowing the graſs ſeeds with the grain, hindered me from hoeing of the barley; but its filling up the intermediate ſpaces, prevented the weeds from growing.

This barley tillered amazingly, at harveſt the ſpaces were filled up, the ſtraw was ſo ſtrong, that it was with difficulty I could get it mowed; the ears were remarkably long, from fifteen to twenty grains on a ſide, and very full and plump.

I had it put in a bay of a barn by itſelf, had it threſhed; the produce was 675 buſhels, which I ſold for 3s. 3d. per buſhel, which is 109l. 13s. 9d. or 10l. 19s. 4d.½ per acre profit; for the clover and trefoil growing up with the barley, made the ſtraw fine fodder, ſuperior to bad hay, therefore more than paid all expences.

What graſs growed after harveſt, I left the winter to keep the roots warm. In the ſucceeding ſpring, early, I ſowed aſhes all over

over the field on the graſs, and rolled it. I had two fine crops of hay, which I ſtacked by itſelf: the firſt cutting was upwards of eighteen tons, the ſecond about twelve tons; ſo that the produce was three tons per acre, which that year was worth 5l. per ton.

As ſoon as the laſt crop of hay was off, I gave it one deep plowing, and ſowed red Lammas wheat in drills, at one foot diſtance, one buſhel of ſeed to the acre. The beginning of May following, I had it hoed with a running hoe (of which I ſhall give a deſcription hereafter) and had the weeds pulled out of the rows, which together coſt me 5s. per acre.

At harveſt there was not a weed to be ſeen, and the ears of the wheat were ſo full and heavy, that they hanged downwards. I had it reaped, and houſed by itſelf, and threſhed; the produce 565 buſhels, which is 56 buſhels and an half per acre, which I ſold for 7s. per buſhel, is 19l. 15s. 6d. per acre; from which deduct the expences of once plowing, 8s. ſeed 8s. drilling in the grain 4s. hoeing 5s. reaping 10s. houſeing 6s. threſhing and carrying to market 15s. the whole amounting

ing to 2l. 16s. deducted from 19l. 15s. 6d. leaves a profit of 16l. 19s. 6d. per acre.

As ſoon as harveſt was done, I plowed in the wheat ſtubble, and let it lay in a rough ſtate the winter. In the ſpring early I harrowed it, and gave it a deep plowing, and ſowed, broad caſt, twenty buſhels of the white Poland oats, and harrowed them in. In May had them weeded by four boys, who were a week, which coſt me 12s. Had them cut at harveſt, and put by themſelves and threſhed; the produce was 640 buſhels, which I ſold for 3s. per buſhel, is 96l. or 64 buſhels per acre, is 9l. 12s. from which deduct the expences of once plowing, 8s. two buſhels of ſeed, 6s. ſowing and harrowing, 3s. weeding, 12s. mowing, 4s. houſeing, 6s. threſhing and carrying to market, 12s. the whole amounting to 2l. 11s. deducted from 9l. 12s. leaves a profit of 7l. 1s per acre.

The land having gone under its regular courſe, is ready to begin with fallowing and manuring again, which will continualy keep the land improving, inſtead of impoveriſhing; and as it is five years going through its regular ſucceſſion, the land under tillage, ſhould be divided into five parts——for inſtance,

ſtance, we will ſuppoſe a plantation to be 50 acres, or 500; if 50 acres, there will be 10 fallowed every year, 10 under graſs, and 10 under barley, 10 under wheat, and 10 under oats; if 500, there will be 100 acres under each.

I am fully convinced, that 50 acres of land properly managed, will produce more than 500 badly conducted. The profits of the 10 acres, if you examine the above accounts, you will find brought upwards of 120l. a year, clear profit. If 50 acres were conducted in the ſame manner, the profits would be 600l. a year.

I think that thoſe obſervations evidently confirm, that ſavings of manure and labour, in huſbandry, produce poverty; and that lands are too frequently brought into diſrepute, from the want of proper management. I am well convinced, that there is no land (that can be plowed) let it be of what ſort or nature it will, but may be made to produce a profitable crop, either of grain or graſs (if the proper ſort was adapted to the ſoil) and that it would be much more advantageous to cultivate one hundred acres, in a complete

complete manner, than two hundred acres, in a ſlovenly and imperfect manner.

It appears to me, that Providence never intended tilled land ſhould remain uncropped; becauſe weeds will naturally grow on the pooreſt, as well as better ſoils; and occupy land, which, with judicious management, may be advantageouſly cultivated, by meliorating hoed crops; and thoſe vacancies in the fields where grain has been ſown too thin, or deſtroyed by birds or inſects, are generally filled with weeds, which impoveriſh the ſoil more than grain. Hence fallows are unneceſſary, where fallow crops can be introduced.

I have made numerous experiments on fallow crops, which if I was to inſert the whole, would ſwell this treatiſe far beyond its limits; and as they might tend more to perplex than to convey uſeful knowledge, I will only ſelect the moſt uſeful.

Curious reſearches into the works of Providence, will inveſtigate the cauſe, why ſome crops improve lands more than others: let this enquiry be our preſent attempt.

Beans,

Beans, peas, potatoes, tares, vetches, clover, lucern, ſaint-foin, burnet, trefoil, and every other vegetable and graſs that produce a ſucculent leaf, imbibe much nouriſhment from the atmoſphere; their ſhade prevents the ſolar rays exhaling the moiſture from their roots, which are numerous.

Horſe beans are a very good fallow crop, but will not grow on all lands; a ſtrong loam or clay are moſt ſuitable: ſands and gravels are contrary to their nature. On a ſoil that ſuits them, their tap roots will grow from twelve to eighteen inches, or more, perpendicularly deep. Their numerous fibres, or laternal roots, will extend themſelves horizontally in a well looſened ſoil, as long as their roots and their ſize will be in proportion. Conſequently the increaſe of produce, will alſo be in proportion to the roots and fibres.

I have particularly obſerved in dry ſummers, that the greater the diſtance between, and the thinner the beans grew in the rows, the more they were blighted; but when thick they were not much affected. This convinced me, that there was not a ſufficient ſhade to prevent the ſun from exhaling more moiſture from the roots, than what is returned by

by dews. In order to remedy this, where the beans grew thin, I have given them deep and frequent hoeings, which had the defired effect; for the ground being kept open, the dews eafily penetrated to the roots.

The blight is occafioned by the plants being deprived of nourifhment, that for want of a proper fupply of juices, they become fickly, the circulation being ftopped in the leaves and extreme parts of their ftalks. Hence the perfpiration is converted into a fweet mucilage, which harbours the black infect called the Dolphin Fly, but vulgarly termed the Blight.

As beans are a profitable crop, as well as great benefit to the land, and will grow on ftiff lands in the drieft fummers, obferving the cautions above, I will give directions for their cultivation. They may follow any grain; and to prepare the land for them, plow in the ftubble after harveft; a month after, harrow it well, and late in the fall give it another plowing, as deep as poffible, crofsways, in one-bout ridges. In the winter, haul on the manure, and as foon as the weather will permit, in the fpring, fpread the manure,

manure, and plow it in, and ſet or ſow your beans as ſoon as poſſible.

If you have a drill, ſow them at a foot diſtance between the rows, and at three inches in the rows. If you have no drill, ſtrain a line, and ſet them with dibbers, at the ſame diſtance about three inches deep in the ground. It will take four buſhels of ſeed to the acre. As ſoon as they are up three or four inches high, they ſhould be hoed, and as ſoon as they begin bloſſoming, ſhould be hoed again and moulded up.

By this method I have had 90 buſhels on an acre, which I have ſold at 5s. the buſhel, and an excellent crop of wheat the following year. They are the beſt feed for horſes, and hogs, far exceeding any other grain for fattening.

The next fallow crop that ranks on my liſt is peas; their effects as a meliorating crop are great; their ſhade prevents the ſolar rays exaling the moiſture from their roots. In a well pulverized ſoil, the roots of peas will extend horizontally from twelve to eighteen inches; for the cloſer the peas are planted in the drills, the more they thrive and enrich the land: and inſtead of robbing each other of their food,

food, they become combined into a formidable body—Therefore, by ſupporting each other, they are better enabled (than when ſingle or few in number), to force their paſſage through the earth in ſearch of food.

The more numerous are the plants of peas, the thicker is the ſhade, and the more is the moiſture retained in the ground. Hence they cauſe a putrid fermentation which fertilizes the ſoil.

Early hoeing kills weeds, prevents their growth, ſo as to be ſoon ſtifled by the drilled peas; it alſo looſens the ſoil, and admits the extention of the roots; and as they are generally cut early, time permits to give the better tillage for wheat. They will grow in all ſoils; but in a ſtiff fertile ground, they yield the greateſt crops.

There are ſeveral ſorts of field peas; but the moſt uſeful are the Marlborough, maple, horn-grey, blue poplar and Dutch admirals. The Marlborough and maple, are large peas; the former is ſpeckled, and the latter of a hazle color; the horn-grey, and blue, are ſmall peas; the former of a grey color, the latter of a blue. The poplar, and Dutch admiral,

admiral, are white peas; the former ſmall, and the latter large.

Of all pulſes that are ſown or propagated, peas claim the pre-eminence, not only for their general uſe, both by ſea and land, for man and horſe, but alſo for the diverſity of their kinds ſuited to different ſoils. The large ſort require a rich moiſt earth, and the ſmall will grow on ſands and gravels. If the crop is ſufficient to ſhade its roots, once or twice hoeing will be ſufficient; but if not, and the ſummer ſhould be a dry one, they will require frequent hoeings to prevent the dolphin fly from taking of them.

The land ſhould be prepared in the ſame manner as I have directed for beans; the ſmall ſort are hardieſt, therefore may be ſown early in the ſpring; the others ſhould be ſown ſome time in April at furtheſt; the large ſorts of peas ſhould be ſown in drills, one to every inch and half, and three feet between. The ſmall ſorts ſhould be one inch apart in the drills, and two feet between; four buſhels of ſeed is the quantity for an acre. I have had 90 buſhels on an acre, which I have ſold for 5s. per buſhel, and have had a very great crop of wheat the following year.

The next fallow crop on my liſt is potatoes, which are generally ſuppoſed to impoveriſh land. My crops of wheat after potatoes, have, in every experiment, proved as good and fine as after any other vegetable, or fallow equally manured. I had two ſucceſſive crops of potatoes, the laſt of which produced 30 ſacks more than the firſt; with an excellent ſucceeding crop of wheat, and the ground being left in good order, gives me reaſon to conceive, that potatoes do not impoveriſh the land.

In order that I might have an opportunity more conveniently and minutely to inveſtigate the growth of potatoes, and to attain ſome further knowledge of the moſt advantageous method of their cultivation, I made the following experiment, viz.

On the ſecond of May I had ſix large potatoes, that weighed two pounds and two ounces, cut into thirty three ſets, with two eyes each, which were planted in a ſtiff deep ſoil, with a ſmall quantity of rotten dung ſcattered under and over the ſets, which were placed about ſix inches deep, at the following diſtance in the rows, divided by pegs;

No. 1. Eleven cuts, at ſix inches diſtance.
No 2. Eleven cuts at nine inches diſtance.
No. 3. Eleven cuts at twelve inches diſtance.

They were hoed twice. On the tenth of October, the earth was carefully drawn from off the plants, which were extended acroſs the rows, each meaſuring alike one foot. The produce was as follows :

No. 1. Contained 124 potatoes, which weighed 28lbs. 10 ozs. and occupied ſix feet in length.

No. 2. Contained 130 potatoes, which weighed 32lbs. 2 ozs. and occupied nine feet in length.

No. 3. Contained 145 potatoes, which weighed 31lbs. 2 ozs. and occupied 13 feet in length; the total weight was 91lbs. 14 ozs. which is in proportion to 123 hundred weight to an acre, and at 4s. the hundred, comes to 24l. 12s. per acre.

Although the ground was dug about a foot deep, the plants and fibres did not grow perpendicularly, but horizontally acroſs the rows, ſo far and ſo high as the looſened or hoed earth extended.

Hence

Hence it evidently appears, that the ſoil being continually moved by the growth of the potatoes and hoeings, its particles are ſo minutely divided, as to permit the free admiſſion for the atmoſpherical influences, which fertilize the land, and renders the ſucceeding crops more productive after a fallow crop; for the ſoil being more pulverized, the roots of the ſucceeding plants can the eaſier range in ſearch of food; which, in proportion to the nouriſhment they acquire, fills the grain, and makes it weigh heavier, than when its roots are confined; and is the moſt certain proof, that good tillage is one of the greateſt ſecrets in agriculture.

I am convinced from the many experiments I have made, that on good loamy or ſtiff ſoils, wheat may alternately ſucceed either beans, peas, potatoes, or any other meliorating hoed crops for any number of years, provided the ſtubble is immediately, or ſoon after harveſt, plowed as deep as the ſtratum will admit, into one bout ridges, by which the ſoil will be kept dry and expoſed to the froſts, that will pulverize it. This mode, with the addition of proper manure, once in about four years, will keep the land in excellent order, and improve it. I have experienced, that

that one plowing in the fall, is of more benefit, than two plowings in the ſpring.

As manures cannot always be procured in ſufficient quantities to dreſs all the land the farmer would wiſh, I will put him in a way, from my own experience, which, with a few ſhillings, and a little labour, he may dreſs an acre of land, or as many as he pleaſes.

In ſands and gravels, buck-wheat plowed in while green, is a good dreſſing. The land ſhould be plowed in the fall, and laid up in ridges as before directed, to bring the land into a fine tilth, harrowed and plowed in the ſpring, and the beginning of May ſhould be ſown with a buſhel and an half of buck-wheat, and harrowed in, in July. When in full bloom it ſhould be well rolled and plowed in, in broad lands. When this is done, there will ſome appear above ground, between the furrows, that the plow did not cover. This muſt be ſtruck down with an iron inſtrument, like a paddle, or paring-ſhovel, and let it lie in that ſtate for a month.

In this time it will ſmoak, ſo as to be ſeen a great way, like a dung-hill; and as it is a green dreſſing will quickly rot in the ground.

The

The next thing is to harrow it; then plow and ſow wheat in broad lands; if you have a good crop of buck-wheat, it will be a good dreſſing for three years.

This great improver of land is ſuch a friend to the farmer, that if its value was more generally known, this method would be more practiſed.

When the crop of wheat is off, you may plow in the ſtubble and ſow winter barley, and the ſucceeding year oats, and after that a turnip fallow, to clear it well from weeds.

Clover plowed in, is a good green dreſſing. You may mow the firſt crop; and if you have a good ſecond crop, do not be afraid of plowing it in, as it will fully repay you in your crop of wheat. It ſhould be rolled and plowed in, the ſame as the buck-wheat. After it has lain ſome time to rot, you may harrow in your wheat; for it ſhould not be plowed again, as directed for the buck-wheat.

I had near my houſe a ſmall field which contained three acres and a quarter, two acres of it were ſaintfoin, and the remainder

acre

acre and a quarter was lucern. Theſe graſſes ſerved eight horſes (which was in continual work) for green meat; during the ſummer, it was cut and brought to the ſtable, a ſmall patch every day, and by the time they had gone over the field, where they had firſt began was ready for cutting again.

In about ten years the lucern began to wear out; that is, the twich and weeds had got the better of it; therefore in the fall of the year, I had that acre and quarter plowed up; it was ſo tough and matted with the twich graſs and weeds, that the furrows were ſolid from one end to the other. I had it tore to pieces with heavy harrows, and with rakes had the rubbiſh collected together in heaps, got ſome dry bruſh wood and put it under the heaps and ſet it on fire; ſpread the aſhes and gave it another plowing, and laid it up in one bout ridges.

In the following ſpring harrowed it well, and raked the ſtuff together and burnt it, and ſpread the aſhes as before, and gave it another plowing; the latter end of May, harrowed and plowed it again. By this time it was as fine as a garden. The beginning of July plowed it and ſowed it with turnips; had a very great crop, which paid me

me upwards of 20l. by feeding it with ſheep. In the following ſpring, ſowed ſpring barley, and lucern, each at 12 inches apart in the rows, that is, a row of lucern, between every row of barley, and a row of barley between every row of lucern ; ſo that there was 6 inches between the barley, and lucern. At harveſt I had upwards of 80 buſhels of barley cut off the acre and quarter, and a very promiſing crop of lucern left, and ſo clean not a weed to be ſeen ; in the following ſpring had it hoed, cut it the latter end of May, had a ton and half of hay. As ſoon as the hay was off, had it hoed ; the latter end of July cut again, had about a ton of hay ; had it hoed as before, in October cut it again, had upwards of half a ton of hay.

This method I purſued, and the crops increaſed every year. The following year I had about a ton more, and the third year when I reckoned it had come to maturity, I had upwards of five tons. This proves as I ſaid before, that good tillage is the grand ſecret of agriculture, and the crops will amply pay the huſbandman for his labour.

OF

OF PLOWING AND HARROWING.

Plowing is the action of breaking up, opening, and pulverizing the ſoil, that the roots and tender fibres of plants may be enabled to extend themſelves in queſt of food.

When the ſoil has been well looſened by deep repeated plowings and harrowings, its particles are minutely divided, and the roots of plants have liberty to ſpread freely. Hence they are enabled to acquire ſuch nouriſhment as could not poſſibly be obtained, when confined between large impenetrable clods of earth.

Thorough plowing, in a great meaſure, ſupplies the want of manure, by keeping the earth in a looſe ſtate, ready for the reception of atmoſpherical influences.

Duhamel ſays, " It is much more profitable to increaſe the fruitfulneſs of land by tillage than by dung:

" 1ſt. Becauſe only a certain quantity of dung can often times be had, the produce of 20 acres being ſcarcely ſufficient to dung one;

whereas the particles of the earth may be divided and ſub-divided, ad infinitum. The benefit that can be procured from dungs is therefore limited; whereas no bounds can be ſet to the advantages which ariſe from tillage

" 2d. Moſt plants that are reared in dung, have not the fine flavour of thoſe that grow in a good ſoil, which has not been dunged. Greens and fruits are ſeldom ſo good in the neighborhood of great cities, where dung abounds, as in country gardens, where it cannot be ſo laviſhly beſtowed. But nothing is more ſtriking, than the difference between wine produced by a vine that has not been dunged at all, and that which is made from a vine that has been greatly dunged.

" 3d. Dung, which according to Mr. Tull, acts by fermentation, cauſes indeed an internal diviſion of the particles, which may be of great uſe; but the plough not only divides the particles, but changes the ſituation, by turning the earth upſide down. The part which was expoſed to the influence of the air and dew, takes the place of another part which is removed from underneath to the ſurface, and the earth that is turned up is penetrated by the rain and dew, and by the rays of the ſun; all which greatly conduce to render it fertile.

" 4th. Dung harbours inſects, which afterwards feed upon the plants and ſpoil them. It is well known, that when lands are dunged in which trees are planted, their roots are in great danger of being hurt by inſects; and this is one of the chief reaſons why floriſts baniſh dung from their gardens.

" 5th. It is true, that dung is equally beneficial to light and ſtiff grounds; but the ſame may be ſaid of tillage.

" Too ſtrong land is that of which the parts are ſo cloſe, that roots cannot penetrate them without great difficulty.

" Now, if roots cannot extend themſelves freely in the earth, they cannot draw from it the food of plants, which, for want of that food, will droop and languiſh. But when thoſe lands ſhall have been divided by tillage, when their particles ſhall have been ſo ſeparated, that roots are at liberty to extend themſelves, and traverſe all thoſe ſmall ſpaces, they will be able to ſupply the plants with their neceſſary food, and they will thrive apace."

Tillage is equally beneficial to light lands; but for a contrary reaſon. The fault of theſe lands

lands is their having too great ſpaces between their particles; and as moſt of thoſe ſpaces have no communication one with another, the roots traverſing the great cavities, without touching the particles of the earth, draw conſequently no nouriſhment from it. But when the particles have been broken by repeated plowings, the leſſer intervals are multiplied at the expence of the greater: the roots have liberty to extend themſelves, and they glide in, as it were between the particles, meeting with a certain reſiſtance which is neceſſary to their taking in the nutritive juice which the earth contains.

Mr. Evelyn, quoting Sir. Hugh Platt, ſays, "That if you take a certain quantity of even the moſt barren earth, you can find, reduce it to a fine powder, and expoſe it for a year to the viciſſitudes and changes of the ſeaſon, and influences of the heavens, it will acquire ſuch a generous and maſculine pregnancy, within that period, as to be able to receive an exotic plant from the fartheſt Indies, and to cauſe all vegetables to proſper in the moſt exalted degree, and to bear their fruit as kindly with us, as they do in their natural climates."

We

We are to ſuppoſe theſe exotics to have their due degrees of heat and moiſture given them. To what ſhall we aſcribe this great fertility? To the great diviſion of the particles of the earth, and the multiplication of their ſurfaces.

" By this toil (viz. pulverizing the earth,) adds he, " it is found that ſoil may be ſo altered from its former nature, as to render the harſh, and moſt uncivil clay, obſequeous to the huſbandman, and to bring forth roots and plants, which otherwiſe require the lighteſt and holloweſt mould.

" But what proves how beneficial plowing is in ſtrong lands to facilitate the paſſages of the water, of the rays of the ſun, and of the roots of plants, is, that their fertility is ſometimes increaſed by mixing them with ſand inſtead of dung.

" Sand itſelf affords no nouriſhment, but by preventing the particles from returning, it produces the deſired good effects. It does not appear, that light grounds require quite ſo many plowings. It might even be feared, leaſt by frequent turnings of ſuch lands, and expoſing their parts to the ſun, they might be exhauſted.

" But

" But though the ſun robs the earth of its moiſture, yet few of the particles fit for the nouriſhment of plants are exhauſted with it; and experience ſhows, that light lands are bettered by being plowed; either becauſe the breaking and ſtiring of their particles renders them fitter to receive the moiſture of rain and dew, to profit by the influencees of the air, and be penetrated by the rays of the ſun; or that the internal pores are better fitted for the extenſion of roots; or again, becauſe frequent plowings deſtroys weeds, which are more apt to grow in light grounds than in ſtrong, eſpecially when they are dunged.

" To prove by an experiment, what we have juſt advanced, with reſpect to light ſoils: let one half of a field be indifferently plowed, and the other half be plowed extremely well. Some time after, and in dry weather, let the whole field be croſs-plowed. The land of that half the field which was thoroughly plowed, will be of a darker colour than that of the other half, which was but ſlightly plowed. This ſhews the benefit the land has received by plowing.

Some think to ſupply the want of plowing, by harrowing their land greatly after it has been

been ſown; but this way of ſcratching the earth is of little ſervice; and, when it is moiſt, the horſes poach and damage it conſiderably."

In the year 1759, Mr. Delu gave five plowings to a wheat field, which had not been dunged; and at harveſt, had taller and finer grain there than any the neighboring grounds produced, which had been dunged and cultivated in the uſual way.

I knew a farmer, who had not ſufficient quantity of dung to cover more than half his fallow, which he ſowed with wheat; the other half he intended for ſpring barley, but was adviſed (rather than leave the ground uncropped) to give two extraordinary plowings, and ſow that alſo with wheat, which he did; and reaped a greater crop of better grain off the undunged than the dunged land.

In ſhort, the advantage reſulting from thorough pulverizing the land is ſo great, particularly when plants are growing, that in ſome places it has been found fully to repay the expences, even of hoeing between grain ſown broad caſt.

FERTILIZING

FERTILIZING STEEPS.

As I have made numerous experiments with ſteeps; to recapitulate the whole, might tend to bewilder the imagination. Therefore as I have found the following to be the moſt fertilizing, and effectual to prevent blights and ſmut, I ſhall confine myſelf to them only.

Take one peck and an half of freſh and dry wood aſhes, and one peck of unſlacked lime, which put into a tub that will contain about 40 gallons of water, then add as much water as will ſlack the lime, and render the mixture (which ſhould be well incorporated) into the conſiſtence of ſtiff morter; in this ſtate it ſhould remain ten or twelve hours; afterwards add as much water as will reduce the mortar to a pulp, by ſtirring; then fill the tub with water, which muſt be ſtirred for two or three days; then draw off the clear lye into a proper veſſel for ſteeping the grain, and gradually put the grain into it, ſkimming off the light grain that ſwims.

After it has ſteeped ſix hours, let it be taken

ken out, and immediately ſpread on a clean floor to dry, when it will be ſufficiently prepared for drilling or ſowing. The lye will retain its full virtue, and the ſame may be repeatedly uſed.

On examining the grains of wheat and barley through a microſcope, I have frequently obſerved the animalcules which appeared like ſmall quantities of black powder on the flat or hollow part, or on the downy and germinating end of the grain.

In order to diſcover what effect the ſteep lye would have on inſects, I procured two common red worms, alike in ſize and ſtrength, one was put into a glaſs of ſpring water, the other into a glaſs of the lye; the laſt immediately appeared to be in great agonies, and died within forty minutes. The worm that was put into the ſpring water, was alive and active at the expiration of three weeks.

From this experiment I conclude, that as the lye operated ſo violently on an amphibious inſect, animalcules, that are not amphibious, muſt naturally be deſtroyed in a much ſhorter time. And in every experiment, I have found this lye to anſwer fully

my expectations as a fetilizer, killing the animalcule and preventing blights and ſmut.

I ſhall add one more, by uſing of which, I have had amazing large crops:

Take half a buſhel of the grain you intend ſowing, put it to five pails-full of water, and boil it in a copper till the grain burſts, and the water thereby becomes impregnated with the eſſential ſalt of ſuch grain; ſtrain the liquor, (you may give the grain to the poultry, that there may be no waſte,) while the liquor is hot put three pounds of nitre, or refined ſalt petre, that it may diſſolve, and add four or five pails-full of water which drains from the dung hill, or ſtale urine of any ſort. And in this prepared liquor ſteep the grain twelve hours.

Let the liquor be four inches above the grain in the fat or tub, as the grain will ſwell and imbibe it. This liquor muſt be warm when the grain is put in, and ſtop all as cloſe as you can, for that cauſes the ſalts to be put in motion. Imbibe the grain in the morning, and in the evening take it out, and ſpread it on a clean floor to dry, and by morning it will be fit to ſow. The liquor that is left, will ſerve again, with the addition

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on of 3lbs. of nitre, and when you have done with it, it is admirable to ſprinkle over a garden.

The excellency of this receipt, is obvious in ſeveral caſes. 1ſt. It ſaves ſeed. 2d. It in ſome meaſure ſupplies the defect of full dreſſing the land, by the ſeed being full of riches when ſown. 3d. It produces a greater quantity than ordinary; laſtly, by this ſteeping, the grain will make its way out of the ground, if drought ſhould ſucceed, which often is the caſe in ſpring grain, to lay a long time before it vegetates. From this receipt, I have had from thirty to forty ears from one root.

The preſent mode of cultivation in this country, is very imperfect and erroneous. I ſhall firſt obſerve the meadows, which, in general, are ſwamps, bogs, or other parts where ſtagnated waters lay, which kills the natural graſs and ſweet herbage, and forces up in its room a four coarſe graſs full of tuſſucks, that has no nouriſhment in it, either for creature or beaſt. If that ſort of land was properly drained, according to the directions before given, that noxious graſs would die of itſelf, and ſweet herbage grow in its room. The watered meadows, likewiſe,

wiſe, produce a ſour waſhy hay, that has in it very little nouriſhment.

I will maintain that there is more nouriſhment in one ton of good upland hay, than there is in three tons of that ſort.

Every farmer might chooſe ſome of his upland for natural graſs, and as for foreign graſſes, they might be adapted to the different ſoils. The pooreſt land will bring good crops of ſome of them, of which I ſhall treat hereafter. See foreign graſſes.

Secondly, on arable land. The farmers in general, in this country ſeem to have ſtudied the cultivation of no grain but maize or Indian corn: the culture of that they appear to underſtand well. It ſuits the Indians, as they have ſuch a plenty of land, but being of a roving diſpoſition they are not longer in a place than juſt to have two or three crops, and then remove to another ſpot. That cultivation may ſuit ſome of the farmers here, as well as the Indians (from whom they learned) as long as they can do like them; that is when they have wore out their land, to remove to another place; but when this country increaſ-

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es in population, and gets thicker inhabited, the caſe will be altered.

There is no grain ſo great an impoveriſher of land as Indian corn; yet I have ſeen it planted on land that would have brought an excellent crop of wheat; and if they had two ſucceeding crops of wheat, it would not have impoveriſhed the land ſo much as one of corn.

Wheat in general follows the corn, ſown among it as it ſtands: and ſo on alternately, till the land is worn out. By this method, there is ſeldom above two or three good crops at firſt; every ſucceeding crop dwindles, which on the contrary, were they to follow the dictates of reaſon, in changing the crops from impoveriſhing to a meliorating, proper plowing, manuring, &c. they would ſoon find the benefit.

By peruſing this treatiſe with proper attention, every thing that is neceſſary may be known: but as there are ſeveral obſtinate and conceited people, ſome very ignorant men that I have diſcourſed with—who have told me, they know as much of farming as any one—

one—ſuch people I do not expect will give themſelves that trouble.

For a new and advantageous mode of culture, I refer the reader to my experiments on fallows and fallow crops, wherein is proved by occular demonſtrations, the advantages accruing by proper pulverizing the earth, changing of crops, and letting grain and graſſes grow in rotation, which will continually keep the land in ſufficient heart to ſupport its crops.

I ſhall now proceed to explain the nature and properties of grain, and graſſes, with their proper culture: firſt I ſhall begin with the moſt noble and uſeful of all grain,

WHEAT.

There are ſeveral ſorts; but I ſhall only mention thoſe moſt uſeful, which are the red and yellow lammas, the cone or bearded, and the Siberian or ſpring.

The

The red lammas has a red ſtraw and a red ear. This is the beſt wheat, as it makes the fineſt flour.

The yellow lammas, has a red ear and a white ſtraw, and is the ſecond beſt.

The cone or bearded, is hardy, and will ſtand the inclemency of the weather, better than either, neither is the fly ſo apt to take it; beſides the long beard protects it from the mildews; but the flour is harſh and coarſe; therefore that ſort of wheat ſells ſix pence in a buſhel, cheaper than the other. The ſpring or Siberian is very uſeful, as there is more time to prepare the land, that it may be ſown after the winter fallow; there is one caution I beg leave to notice, that the grain of ſpring or Siberian wheat, is much more liable to drop out of the ears than the winter wheat. Hence, it ſhould be particularly attended to, and cut before it is too ripe.

When wheat is planted or ſown early in the fall, leſs ſeed is required to the acre, than when planted late; becauſe leſs of it will die; and poor land ſhould always be allowed more ſeed than rich, becauſe a greater number of the plants will periſh on this land than the other. The leaſt quantity

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of ſeed is neceſſary for rich land, that is ſown early; for, in this caſe, very few of the ſeeds will fail to produce a plant that will live and flouriſh.

The unſkilful huſbandman conſiders none of theſe things: he goes by a general rule; at all ſeaſons, and on all ſorts of lands, the quantity is the ſame ſown.

Another thing to be conſidered, is, that ſome wheat of the ſame ſpecies has its grains twice as large as others: in this caſe, a buſhel, containing but half the number of grains that it does in ſmaller grained wheat, one buſhel of the ſmall grained will go as far as two buſhels of the large; it is not the meaſure of the ſeeds, but the number of the grains being the thing to be conſidered in regard to the ſowing.

It is a very natural thing to ſuppoſe, that a large grained wheat will produce larger and finer plants, and larger grain than a ſmall grained one; but my experiments have proved that there is nothing in this; for the ſmalleſt grained wheat has produced full as large plants as the largeſt, and thoſe with as great ears

ears and as large ſeeds; but the young plants appeared ſmaller and poorer.

Wheat is the propereſt grain of any to follow clover, lucern, ſaintfoin, or any other graſſes: becauſe it will beſt bear with ſour tilth, to harrow it in after one plowing.

The beſt method for thoſe who keep ſheep is to plow about half an acre at a time; ſow that, and pen the ſheep on it; then plow half an acre more and do the like, and ſo on till the field is done. The larger the fold the better, for the field will be ſooner finiſhed; and by that means the ſheep will be gone from thence before the wheat is much up.—This dreſſing with the fold has ſeveral conveniencies; it not only enriches the land, but treads the grain in, and ſo preſerves it from dying, makes it ſtand faſt againſt the winds, and keeps it from ſpewing out in the winter.

The ſeaſon for ſowing winter wheat, is in the fall in moiſt weather, from the middle of Auguſt to the middle of October; the quantity of ſeed is from three pecks to a buſhel and half per acre. The ſpring wheat ſhould be ſown in the ſpring, as ſoon as the ſea-

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ſon will permit; from a buſhel to a buſhel and half per acre.

The imperfections of the old or common method of cultivation appearing to me very erroneous, cauſed me to make many different experiments on wheat, as well as other different grain, to endeavour to find out a remedy, and if poſſible to adopt ſome new or better method of culture: by obſervations and cloſe attention, I ſoon ſucceeded. I fixed together with a pole three harrows, which, when meaſured I found would cover the breadth of nine feet.

I accordingly had my fields formed into eight feet ridges, the three harrows completely covered theſe ridges; and inſtead of the horſes treading the pulverized land, four horſes were parted, two walked in the furrows each ſide of the ridge, by which the ſoil was properly harrowed without being trod or hardened, and the ground made ſufficiently fine. The repeated trials I have made of this new mode of culture, has ſufficiently confirmed me of its utility.

One recent experiment will, I preſume, as well as one hundred, illuſtrate its ſuperior advantages.

vantages.—A field of four acres which had a crop of potatoes, which I could not get out of the ground before the middle of November; therefore the land could not be got into proper order before the beginning of December, as it was in an excellent tilth, curiosity induced me to sow it, even so late in the season with cone or bearded wheat; for which purpose my drill machine was used on part of the field; which was planted with a proportion of three pecks to an acre, the rows at one foot apart, on ridges eight feet broad; but such an excessive fall of rain commenced, as soon reduced the soil to a mere quagmire, the horses sunk up to their knees in the ridges. Hence the drill could not be any more worked.

This part of the field being drilled, and no prospect of more favourable weather at so late a period of the season, my servants and myself (attending the operation of the machine) were thorougly wetted. The weather being rather warm, my people continued in the field, sowed the remainder with a bushel and half per acre, and even in such a wet state harrowed in the seed with three harrows covering the ridges, two horses walking in each furrow. And that I might be further convinced of the disadvantages attending the horses

horſes treading on the ground, I had two ridges harrowed by the horſes walking thereon.

The beginning of May, I had the drilled wheat hoed, which coſt me four ſhillings per acre; the other part of the field was weeded, at an expence of five ſhillings per acre; and during the whole time of its growing, the drilled wheat, viſibly appeared ſuperior, in every reſpect, to the broad caſt; the ſtraw was in ſize ſimilar to reeds, many meaſured ſix feet in length, and the ears contained from ninety to one hundred and twenty grains.

The beginning of September, I had three perches each, of the drilled, the broad caſt by the new mode of culture, and the broad-caſt ſown in the common way, carefully cut, carried into the granary, and there threſhed; and altho' ſuch a number of inconveniences attending it, ſuch as bad weather for ſowing, the late ſeaſon, the birds, inſtigated by hunger, at that ſeaſon, pick up a great deal of the grain, will even ſcratch off the ſnow and get at the milky grain, which they feed on; under all thoſe diſaſters the produce was as follows; the drilled, four pecks and half a pint; or per acre, fifty-three buſhels and

three

three pecks. The broad caſt, new mode, three pecks and ten pints; or, per acre forty-eight buſhels, one peck and five pints. The broad caſt, old mode, two pecks and ſix pints; or, per acre, thirty-one buſhels, two pecks and ten pints.

This comparative view, clearly illuſtrates the diſadvantages attending horſes walking on the grain, after it is ſowed; which old mode produced near ſeventeen buſhels per acre leſs, than by the new method of the horſes walking in the furrows; and although the drill worked to every diſadvantage, in what might be partly called mortar, with only depoſiting half the ſeed, and at twelve inches diſtance between the rows; yet it produced five buſhels one peck, and eleven pints more than the new broad caſt mode, and twenty-two buſhels ſix pints more than the common old broad caſt mode: which plainly ſhews the ſuperiority of the drill huſbandry.

There is not any part of huſbandry which requires the farmer's attention, more than that of keeping his land clean from weeds; and yet there are few who trouble themſelves about it, or who underſtand the proper method of doing it. Few of them know thoſe weeds which are annual, ſo as to diſtinguiſh them

them from thoſe that are perennial; and, without this knowledge it will be much more difficult for a perſon to clean his land, let his induſtry be ever ſo great: for annual ſeeds may ſoon be deſtroyed, if taken in time; whereas, if they are neglected, their ſeeds will ſoon ripen, and ſcatter; after which it will require three times the labour and expence to get rid of them, as would have been ſufficient at the beginning; and then the crop would have had no bad neighbours to rob it of its nouriſhment.

There is alſo another great advantage in keeping grain clear of weeds, which is,—it is not ſo liable to blight or take the ſmut, as when it is full of weeds, as I have frequently obſerved; for cleanlineſs is as eſſential to the well doing and growth of vegetables, as in animals—And the changing of ſeed annually is alſo as neceſſary as the change of air is to all ſorts of animals: for where this has been carefully practiſed, there has rarely happened any ſmutty grain on the farm.

When wheat is not ſown after graſſes (which is the beſt method,) the land ſhould be fallowed and dreſt; the method is to plow it into narrow ridges, in the fall, and let it lay in that rough ſtate all winter. In the ſpring

ſpring, as ſoon as the weather will permit, harrow it down, and as ſoon as the weeds begin to vegetate, plow it again; then harrow it and give it another plowing before you ſow; for the more it is plowed and harrowed, the better will be the crop, and the fewer weeds will be produced.

There is alſo a very abſurd method in common practice with the farmers, which is the carrying of their dreſſing and ſpreading it on the land in the ſummer; where it lies expoſed till the ſun has dried out all the goodneſs of it, before it is plowed into the ground, ſo that the dreſſing is of little value or uſe; the dung ſhould never be laid on the land faſter than it can be plowed in; for one load of dung ſo managed, is better than three in their uſual method.

As wheat remains in the ground a longer time than moſt other ſorts of grain, it requires a greater ſtock of nouriſhment, to lengthen and fill the ears; therefore if the dreſſing is exauſted in winter, the grain will have but ſhort ears, and thoſe but lean, nor will the grain afford much flour: ſo that it frequently happens, that a light dreſſing of ſoot or aſhes in the ſpring, at the time when the wheat

wheat is beginning to ſtalk, proves of great ſervice.

Deep plowing, where the ſtaple of the ground is deep enough to admit of it, will alſo be of great ſervice to the wheat or any other grain; for the ſmall fibres of the roots, which are the mouths that ſupply the nouriſhment, extend themſelves very deep into the ground: I have traced many of them upwards of three feet, and do believe they ſpread much farther where the ground is light; therefore it is of great advantage to the crop to have the ground looſened and ſtirred to a proper depth.

RYE,

Is a grain that delights in a dry warm land, and will grow in moſt ſorts of earth, ſo that it is brought into a fine tilth; it does not need ſo rich a ground, nor ſo much care or coſt as wheat, only it muſt be ſown in a dry time, for rain ſoon drowns it: wet is a great enemy to it; therefore dry, gravelly, or ſandy, warm land, is uſually termed rye-land, being more proper for that than for any other grain. It is quick of growth, ſoon up after it is ſown, and ſooner in the ear, and ripe, than other grain:

grain: the beſt time for ſowing of it, is in September, or October will do if it is dry. It ſhould be ſown after a ſummer fallow. It requires more ſeed than wheat, as it doth not tiller ſo much; from a buſhel and an half to two buſhels and an half of ſeed is the quantity to be ſown on an acre. It is ripe when the ſtraw is yellow, the ear bends, and the grain feels hard. It ſhould be well dryed before it is houſed, as it is a grain that will grow in the ear ſooner than any other if it be wet.

BARLEY,

If cultivated in a proper manner, is a very beneficial crop even equal to wheat. And as malt ſpirits, and beer are likely to become more general in this country, by which a great deal of money will be kept here, that is annually ſent out for importing theſe articles. To encourage the growth of this grain, will be a benefit to the nation at large.

Barley is a grain that delights in a fine tilth and rich ſoil, and will do as well with a buſhel and an half of ſeed on ſuch land, as well as two buſhels and an half on a rough and four ſoil.

The land for winter barley ſhould be managed the ſame as for wheat; potatoes prepare the land ſuitable for it, or fallow and dreſs it with a compoſt manure, which is equal to ſtable dung.

Spring barley makes the beſt malt, if the grain is but large and plump, which if you give it proper cultivation, you may have it ſo in the drieſt ſummers. It thrives beſt after a fallow crop of turnips; but if your land is good, in a fine tilth, and drill it, you will be ſure to have a great crop of fine barley.

To make the ground ready for barley after wheat, preſently after harveſt plow in the wheat ſtubble, in four-throughed lands; early in the ſpring harrow it, and bought it up; let it lay a little, then bought it down; harrow it and plow it into broad lands, and ſow it with barley; I have taken this method on a loam, and it proved a tilth as fine as a garden.

A ſingle cluſter of barley growing in a field planted with peas attracted my attention. The numerous ſtalks appeared to be the produce of ſeveral grains, but when pulled out of the ground, I clearly perceived they were only the produce of a ſingle grain, which had been

been dropped by accident; curiosity induced me to count the number of ears, which were twenty-eight, containing in the whole three-hundred and thirty grains. Such an amazing increase, astonished and made me reflect, if one grain produced upwards of three hundred, how came it that farmers could procure no more, and be well satisfied in obtaining a crop from thirty to forty bushels per acre from two or three bushels of seed on good land? The greatest of such product, is only twenty for one, and of course less by three hundred for one, than the produce of the single grain.

Being fully convinced that the old mode of cultivation was very erroneous, I determined to endeavor to find out where the errors lay. I had a bushel of barley measured, it weighed fifty-two pounds and a quarter, and according to the grains in 1 oz. the whole bushel contained five hundred and fifteen thousand grains.

I next had a bushel of wheat measured, it weighed sixty-two pounds, and contained five hundred and sixteen thousand grains. A bushel of poplar peas weighed sixty-four pounds, contained one hundred and seven thousand peas. A bushel of horse beans weighed sixty-four pounds, contained thirty-

five

ſive thouſand beans. A buſhel of the Poland oats weighed thirty-two pounds, containing one million two hundred and ſixty thouſand grains. Theſe were all large ſized grains; therefore the ſmaller ones muſt contain a conſiderable quantity of more grains in the buſhel.

Having thus far proceeded, I next reflected, that admitting every grain ſowed, was to vegetate, and produce no more than forty for one, the produce of two buſhels of barley ſeed, ought to be eighty buſhels per acre.—Therefore I was fully determined as ſoon as poſſible, particularly to inveſtigate the future growth of grain. Opportunity did not permit my making any experiments till the following ſpring, when I had beds dug eight feet three inches long, and two feet wide, which occupies a ſpace of one ſixteenth part of a ſquare perch.

I thought it neceſſary for my future conduct and experiments in agriculture, to reduce the weight of the buſhel of barley, being fifty-two pounds and a quarter, into drachms, that I might the better be enabled to proportion to an acre, the quantity of ſeed moſt advantageous for drilling, and ſowing broad caſt; accordingly found that fifty-two pounds and a quarter, contained thirteen thouſand three

three hundred and ſeventy-ſix drachms. Then reduced an acre into ſixteenths of a perch being two thouſand five hundred and ſixty; and dividing the drachms (thirteen thouſand three hundred, and ſeventy-ſix, the contents of the buſhel,) by the number of ſixteens, (being two thouſand five hundred and ſixty in an acre) found the quotient to be $5,\frac{2502}{2560}$ part of a drachm.

Therefore on the 17th of April, ſowed broad caſt five drachms and a quarter, as being the neareſt proportion of a buſhel to an acre of land, on the firſt bed; and in proportion to two buſhels on the ſecond bed, and to three on the third bed, and to four on the fourth bed;—the ſoil a ſtiff unmanured loam, had been cropped with peas, the laſt year was winter fallowed, and dug a ſpit deep.

Auguſt 23d, cut the four beds, and the produce was as follows:—that ſown at the rate of one buſhel to the acre, 184 drachms, or 35 buſhels per acre. That ſown at the rate of two buſhels contained 207 drachms, or 39 buſhels per acre. That ſown at the rate of three buſhels contained 261 drachms, or 49 buſhels per acre. That ſown at the rate of four buſhels, contained 289 drachms, or 55 buſhels per acre.

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In order to prove the efficacy of the ſteeps before recommended, I divided four parcels of ſeed, the ſame quantities as before enumerated, and ſteeped them in the prepared ſteep of the liquor of the barley boiled, nitre, and ſtale urine, according to the directions there mentioned, and ſowed them in the ſame manner as that not ſteeped: it was up in a few days, and the plants looked much more luxuriant than that not ſteeped; it tillered and branched double as much: that which was ſown the thineſt, was much ſtronger, had longer and fuller ears, and branched much more than the thick ſown, but was not ripe for near a fortnight after the other which was not ſteeped.

The beginning of September, cut the four beds, and the produce was as follows:—that ſown at the rate of one buſhel to the acre, produced in proportion to 66 buſhels per acre. That ſown at the rate of two buſhels produced in proportion to 69 buſhels per acre. That ſown at the rate of three buſhels, produced in proportion to 58 buſhels per acre. That ſown at the rate of four buſhels to the acre, produced in proportion to 56 buſhels to the acre.

This experiment proves the ſteep to be a great fertilizer; which ſaves a great deal of ſeed.

From many experiments I have made, I find a bushel and an half of seed barley, steeped is the proper quantity, whereas by the above experiment of the unsteeped, four bushels is the quantity which produces the most. And that did not produce so much by eleven bushels per acre, as that which was only sown at the rate of one bushel steeped.

In drilling of grain, experience has convinced me, that one inch is the best distance for dropping the seed in the rows, and two inches deep; and in order more fully to be convinced which is the best distance in the intervals, for steeped, and unsteeped, I tried the following experiments: I sowed three beds of each at six eight, and twelve inches, between the rows. I shall first give the quantity of seed (as the steeped and unsteeped took equally the same quantity) that with the six inch intervals had four drills in each bed, which took nine drachms and an half: near two bushels to an acre. That with eight inch intervals had three drills in each bed, which took seven drachms, at the rate of a little better than five pecks per acre. That with twelve inch intervals, had two drills in each bed, and took four drachms and an half, which is at the rate of three pecks and an half per acre. It was each cut and threshed apart. The produce

duce was as follows:—the ſteeped ſowed in the ſix inch intervals, produced in proportion to 90 buſhels per acre. That in the eight inch intervals produced in proportion to 84 buſhels per acre. That in the twelve inch intervals produced in proportion to 72 buſhels per acre. The unſteeped in the ſix inch intervals, produced in proportion to 83 buſhels per acre. That in the eight inch intervals, produced in proportion to 70 buſhels per acre. That in the twelve inch intervals, produced in proportion to 56 buſhels per acre.

Theſe experiments prove the ſuperiority of the drill to the broad caſt, and that the moſt advantageous diſtance between the rows is ſix inches; and the ſteeped is far ſuperior to the unſteeped, particularly where it was ſowed fartheſt apart in the rows, as it had there more room to gather or branch. In the twelve inch intervals it gained 16 buſhels. In the eight inch it gained 14 buſhels. In the ſix inch, it only gained 7 buſhels. I preſume the reaſon was that it had not room in the ſix inch intervals, to increaſe itſelf as it had in the reſt.

Every experiment was left without being weeded or hoed, that I might the better be enabled

bled to obſerve the growth of weeds. In the broad caſt where it was ſown with four buſhels of ſeed to the acre, contained but few: likewiſe that drilled at ſix inch intervals, contained very few or none.

When the barley was cut, the ground which was ſown thickeſt broad-caſt, and the ground on which the ſix inch drills grew, appeared more hollow, blacker and moiſter, than the other; and according to the increaſe of diſtance between the drills, ſo in proportion was the increaſe of weeds and dryneſs of the ſoil.

The roots of the thick ſown, as well as that drilled at ſix inches, were ſo matted or combined together, as to keep the ſoil more hollow, and had extended themſelves farther than any of the others; and I preſume, that the thickneſs of their ſhade prevented the moiſture being exhaled, which cauſed a kind of conſtant fermentation in the ſoil. Hence, the ground appeared more hollow, moiſter, and blacker, than between the drills at greater diſtances.

I have found great benefit in the lye-ſteep made from aſhes and lime, but not ſo equally fertilizing for barley as the other; but for

wheat and peas, by the experiments that I have made, it appears ſuperior.

O A T S,

Are a profitable and neceſſary grain, and are principally recommended for horſes, and commended for that uſe above all others, being of an opening nature. Poultry alſo love them, and makes them lay more eggs than any other grain—There are ſeveral ſorts, but I ſhall diſtinguiſh them under three: the black, red, and white; black oats are commonly ſown upon an etch crop, or a lay, as ſoon as the ſpring will admit, when the earth is moiſt, taking care to turn the turf well, and to lay it even and flat. If ſown broadcaſt, they muſt be harrowed the ſame way as the furrows lie, if a lay, or but a very little acroſs, for fear of turning the turf; but upon an etch, as ſoon as the land is plowed on an edge, ſow and harrow it in at once, and harrow it five or ſix times over, obſerving to harrow once or twice acroſs, which breaks the clods, and covers the ſeed better than harrowing all one way, they are in general ſown after one plowing. Three buſhels of ſeed is the quantity for an acre. If they are drilled

drilled, ſix inches between the rows is the beſt diſtance, and two buſhels to an acre at leaſt, as oats will not tiller and ſpread like other grain; they are ripe when the ſtalk turns yellow, the grain feels hard, and the huſk begins to open and ſhew the ſeed. After they are cut, they ſhould lie for the dew and rain to plump them, and make them threſh well: and, if weedy, to dry the weeds; but if there happens much rain, they muſt be got in as ſoon as dry, otherwiſe the oats will ſoon fall out of the huſks, and great part of the crop be loſt.

This black oat is a hardy grain, and will bear a great deal of wet and cold. There is no land too rich, or too poor, too hot nor too cold for them.

The red oat is moſt common in northern countries; it is a ſort of naked oat, and is very proper for making oat-meal, becauſe the kernel threſhes out of the hull without carrying it to the mill or drying of it. This oat is cultivated in the ſame manner as barley.

The white oat is commonly ſown on an etch, after wheat, rye or barley. The beſt method to prepare the land is, to plow in the

the ſtubble in the fall, and lay it up in narrow ridges; early in the ſpring, harrow it well, and give it two plowings before you ſow, which is to be managed the ſame as the black oat on an etch, and the ſame quantity of ſeed.—They will bear ſowing later than the other, as, the dryer the weather is when they are ſown, the better.

The white oat grows beſt on high dry grounds, either gravels or ſands, and they are the beſt of all to be ſown on land very ſubject to weeds, becauſe, being ſown late, they allow a very late plowing, and growing very quick after this, they over-top the weeds ſooner than any other plant.

BUCK OR FRENCH-WHEAT,

Is a grain exceeding advantageous on barren, ſandy ground. It is uſually ſown as barley, but later, from one to two buſhels of ſeed to an acre; from May, till the latter end of July is the ſeaſon for ſowing of it. It is late before it is ripe. If the ſoil ſuits it, and is not poor, it will yield a great increaſe, from 60 to 70 buſhels to an acre, and is excellent food for hogs, poultry, &c. There is no danger of the ſeeds failing, nor of ſuffering by

by wet ; after it is mown, it muſt lay ſeveral days to dry, that the ſtalks, (which are hard) may wither before it is houſed.

If buck wheat is ſown very thick, and ſuffered to grow till it is in bloſſom, and then rolled down and plowed in, makes an excellent lay for wheat or rye.

HORSE BEANS AND PEAS.

I have before given full and proper directions for their cultivation in the management of fallows, and fallow crops, therefore here ſhall paſs them over, and proceed to

MAIZE OR INDIAN CORN,

Is a very uſeful grain, either for the houſe, horſes, cattle, or hogs : and it requires a leſs quantity of ſeed than any other, and will grow if two or three years old, but is a great impoveriſher of land.

I have made ſeveral experiments in order to find the moſt advantageous method of planting it. The following has exceeded all others.

I prepared

I prepared my land by plowing it up in the fall of the year, in ſingle boughts ; in the ſpring I harrowed it down as ſmooth as poſſible, and plowed it; then I harrowed it again, and marked out the furrows at eight feet diſtance : in theſe furrows, I dropped the ſeed ſingle, at about the diſtance of every foot—my cart loaded with manure from my compoſt heap, followed in the alley between, and covered the ſeed in the two furrows, about three or four inches thick, with the manure. This was done almoſt as expeditiouſly as in the common way, covering it with mould by the hoe.

By this method, the plants came ſoon up, and flouriſhed very vigorouſly. When the plants were about ſix inches high, I plowed between, taking the mould from the plants, and throwed it up in a ridge in the middle of the alley ; and with a hand hoe cut up the weeds and ſuperfluous plants. If they are left at two feet diſtance in the rows they will be thick enough. The ſtirring of the mould ſo near the plants, makes them thrive and grow ſurpriſingly.

The next plowing, I took the mould from the middle, and throwed it up to the plants. Every time of plowing, I uſed the hand hoe to

to ſtir the ground between the plants, and deſtroy the weeds. The third plowing I did as the firſt, throwing up the mould in the middle of the alley. This is of more uſe than a perſon would imagine; for it admits the influences of the air and nitrous dews to penetrate to the roots.

The fourth plowing, (which was the laſt) I managed as the ſecond, by throwing up the mould to the ſtalks of corn.—If this laſt plowing could be ſo contrived, as to be done early in the morning, before the ſun has exaled the dew, it would bury thoſe riches in the ground which would afford a double nouriſhment. My land, where I tried this experiment, is between a loam and a clay.

Sands, and light lands will not require ſo many plowings.

By the above method, middling lands will produce from fifty to eighty buſhels per acre.

TARES AND VETCHES.

Tares are a very uſeful pulſe; the haulm is ſomething like the pea, but exceedingly ſweet

ſweet and nouriſhing for horſes and cows, beſt for cutting and bringing into the ſtable and cow houſe. They are a great ſweetener and enricher of land, by their long luxuriant haulm covering the ground. The time for ſowing is early in the ſpring, three buſhels of ſeed to an acre; the land ſhould be in a fine tilth. If left for ſeed, they will be ripe in Auguſt. In good land there will be from 50 to 60 buſhel per acre.

There are two ſorts of vetches, the winter and the ſummer vetch. Their haulm and ſeed are much like the tare, and their cultivation and quantity of ſeed exactly alike.

The winter vetch is ſown in the fall, and the ſpring vetch early in the ſpring; the former will ſtand the ſeverity of the winter; but the latter is tender.

They are ſown to much advantage in ſome places: they are good, ſtrong and nouriſhing food for horſes, or cattle, either green or in the ſtraw.

GRASSES.

The great improvements that are made by ſowing land in tillage with graſs ſeeds, do

more encourage the uſe thereof, and eſpecially thoſe of clover, trefoil, ſaintfoin and lucerne, becauſe the harrowing in of grain upon only one plowing, ſaves a great expence and time, beſides the produce of large crops; and as ſome of theſe graſſes will ſuit all ſoils, the farmer, if he has no meadow, either wet or dry, may, by the help of theſe graſſes be able to make hay enough for his creatures and ſtock, and to ſpare; which will be a great improvement to dry farms, and be the means of reducing the price of meadow land, which at preſent is very high. I ſhall firſt begin with

CLOVER.

Clover graſs hath been the name a great while, both for the great improvement it brings by its prodigious burthen, as alſo for its excellent ſweetneſs both in graſs and hay, and the riches with which it impregnates the ground, by the ſtalk and roots; the former by receiving the nitrous dews, which deſcend by them to the roots and ground about them; the latter alſo affords a ſort of dreſſing to the ground after it is plowed up; and above all, ſaves that expence which many are at yearly for weeding their ground,

which is by this graſs entirely got under; and alſo the damage prevented that the grain generally ſuſtains by the weeds growing amongſt it: ſo that it may be depended on, nothing better clears the ground of trumpery and weeds than a good crop of clover, as I have often experienced. It enriches and is of great ſervice to ſtiff ſoils, either clay or loam by its deep and lateral roots opening and hollowing the ground, and will in that ſort of land, if it is in good heart, bring a very great crop; but in ſands or gravels, if a dry ſeaſon, the crop will be very ſhort, as it will burn.

The land for ſowing this on, as well as all other ſown graſſes, ſhould be made very fine, that is brought into a fine tilth, otherwiſe above half the ſeed will be waſted. Fallow crops are beſt to prepare the land; turnips, potatoes and peas, I have found to be the beſt, and I have had better crops by ſowing it by itſelf in Auguſt.

If it is ſown with grain, ſpring grain is the beſt; after the grain is up, ſow the clover ſeed and roll it in, for that method new moulds the grain, and makes it grow amazingly, and then there is no danger of the clover getting

getting a head, and damaging the grain as is often the caſe in wet ſprings.

If you ſow it among your winter grain, it muſt be ſown in the ſpring, and buſh harrow it in; this method moulds the grain and covers the ſeed.—The land in the ſpring is often ſettled and baked hard, therefore there cannot be ſo good a chance of having ſo good a crop of graſs with winter grain as with ſpring. In the choice of this ſeed, that which is of a bright yellow, with a good quantity of the purple and brown coloured, ſeed amongſt it; for that ſhows the ripeneſs of the ſeed; when the white and light yellow coloured, is that which has not come to its full maturity, or not ripe. When it is thorough ripe, and well got in, the ſeed will be good for five or ſix years. The quantity of good ſeed to be ſown per acre, is from ſix to ten pounds, according to the fineneſs and richneſs of the ſoil.

In May, or the beginning of June, this graſs will be fit to cut, and there ſhould be great care taken in making of it; for it will require a great deal more labour and time to dry than common graſs, and will ſhrink into a leſs compaſs; but, if it be not too rank, it will make extraordinary rich food for cattle.

The

The time for cutting it is when it begins to flower; for if it ſtands much longer, the lower parts of the ſtems will begin to dry, whereby it will make a leſs quantity of hay, and that not ſo well flavoured.

I have cut three crops of this graſs ſome years; but the beſt way is to cut it once in the ſpring, and feed it the remaining part of the year, whereby the land will be enriched, and the plants will grow much ſtronger.

One acre of this graſs (if a good crop,) will feed as many cattle as three or four of common graſs; but great care muſt be taken of the cattle when they are firſt put into it, leſt it hoves and burſts them: to prevent which the beſt method is, before they are turned in to eat it, let them fill their bellies with ſome other food, and at firſt turn them in only for a few hours, and ſtint them as to quantity; and this by degrees, letting them firſt be in the middle of the day, when there is no moiſture on the graſs, and ſo every day, ſuffering them to remain a longer time, until they are fully ſeaſoned to it: but great care ſhould be taken never to turn them into this food in wet weather; or, if they have been for ſome time accuſtomed to this food, it will be proper to turn them out at night in wet weather, and

let

let them have hay or ſtraw, which will prevent the ill conſequences of this food.

The beſt method of making clover hay, I have found to be thus :—after it is mowed, put it up with the fork or rake in little ſeparate parcels, about the bigneſs of a buſhel, then turn it bottom upwards ſeveral times, till it is made; ſo that you never ſeparate it till it be carted home; by this means the leaf and flower is kept on, which otherwiſe would be moſtly loſt, which is the beſt part of the hay.

If clover is kept for ſeed, and it is a favourable ſeaſon, you may have two crops; but in general there is but one crop ſaved, and that is the ſecond, as it grows more even and has leſs weeds in it than the firſt. When it is kept for ſeed, it muſt ſtand till the heads are very brown, and full ripe, which may be known by rubbing them between your hands. I have had from two crops of ſeed in one ſeaſon, upwards of ſix buſhels on an acre, and from one crop near four buſhels. It is a ſeed that is hard to get out by threſhing, therefore the ſpring is the beſt time for this work when the

the drying winds blow, which ſhould be let into the barn as much as poſſible.

I have made experiments to know the profits of a clover crop; the firſt was as follows: Six acres of clover I cut, and fed cattle in racks, from the latter end of April, to the latter end of October following, which maintained ten oxen, thirteen cows, three horſes, and twenty-ſix hogs; which after the rate of 2s. per week for each kine and horſe, and 4d. per week for each hog, which came to 3l. 1s. 6d. 1-2, or 80l. for twenty-ſix weeks. The ſummer profit then of each acre was 13l. 6s. 8d. beſides the latter-math.

The next experiment was on four acres of clover, which I let go to ſeed. At twice mowing I had twelve tons of hay and twenty four buſhels and a half of ſeed. The hay was not near ſo good as if it had been cut green, therefore I allowed it to be worth only 2l. per ton. The clover ſeed I ſold for 50s. per buſhel, ſo that the amount of the produce of the four acres was 85l. 5s. or 21l. 6s. 3d. per acre. When a clover lay is plowed up, if the land is not rich or in good heart, it is an excellent method to plow in the laſt crop, and you may depend on having a good

crop

crop of wheat after it; this I have experienced often.

A top dreſſing is of great benefit to clover, if ſown over early in the ſpring; on ſtiff ſoils, aſhes or ſoot is the beſt; on light lands, the plaiſter of Paris. If any of thoſe are ſown over ever ſo thin, it will nearly double the crop.

TREFOIL.

Lands naturally kind for grain, and unkind for common graſs, are undoubtedly kind for trefoil; and though it be much impoveriſhed by long ſowing, that it will bear grain no longer, it will bring a crop of this graſs. Experience convinces me that it will grow in any ſoil: even rocky, hilly, or gravelly ground, of a very ſmall value, may be improved by this graſs; but if the land be a clay, and it lays wet, it muſt be drained and made as dry as you can.

That the paſture is as good and better on trefoil than clover, for cattle, and eſpecially cows; for it will not only cauſe them to give more milk in quantity, but better in quality, and alſo makes butter and cheeſe of a delicate yellow

yellow colour. The hay thereof is nouriſhing and makes oxen and other cattle as fat as any other hay, if it be made in good ſeaſon, that is, whilſt it is full of yellow bloſſoms, and not over dry (for it is ſoon made.) It does not looſe its colour, or ſhrink in making, as clover graſs does; but is much finer, greener, and in all points better than clover is. It is particularly good for fattening of ewes and lambs, and free from breeding rottenneſs, which other paſtures are apt to do. And as clover makes ſick and kills many cattle, this is free from any ſuch danger; the cattle are ſo ſenſible of it, that where they are ſown together, they will not touch the clover, till they have eat the trefoil bare.

Trefoil will endure much longer than clover, if it ſtands not for ſeed; for that is deſtructive to the root; becauſe being cut in the heat of ſummer, the heat draws out the ſap which ſhould nouriſh it.

The crop is not ſo bulky as clover, but the many good qualities enumerated as above, makes it a beneficial crop. It is moſt profitable fed green, as it fattens oxen, cows or ſheep in a ſhort time. If made into hay, it ſhould be cut when in full bloſſom; it is ſoon made, as it need not be dryed ſo much as

as other hay. The quantity of feed to be ſown per acre, is, if in the hull, two buſhels; but if the ſeed is naked and clean, from ten to twelve pounds is the quantity per acre; or if ſown with clover, half of each.

Trefoil is ſown the ſame as clover, on a fine tilth, with, or without grain. The making the hay and every particular management the ſame as clover. The ſeed is of a bright yellow colour, not any purple or brown ſeeds like clover, but in ſhape and ſize like it.

SAINTFOIN,

Took its name from the French; for the word Saintfoin, tranſlated into Engliſh, is Holy-Hay, which name they gave it from its excellent nutritive quality.

There may be more benefit reaped from this graſs, than any other; as you may get a very great crop in the moſt dryeſt land, on hills, gravels, ſands, or even barren ground; and it will ſo improve all thoſe lands in ſuch an extraordinary manner that they will bring great crops of any ſort of grain after it.

The ſtalks of the plant in poor land will be two feet high, and in rich land it will grow as high as ſix feet. It has tufts of red flowers, of three, four, or five inches in length of the honey-ſuckle kind: they are ſo beautiful, and ſweet, that I have ſeen them much eſteemed in a garden, and called the French honey-ſuckle.

This plant will make twenty times the increaſe in poor ground than the common turf; and this is owing to its having a long perpendicular root called tap roots, as well as numbers of horizontal ones: the perpendicular ones ſink to a great depth to attract its nouriſhment. The length of this root is ſcarce to be credited by any but thoſe who have ſeen it; I have drawn it out of the ground near fourteen feet; and ſome have told me they have traverſed it to double that length. This is the reaſon, I preſume why this plant will bear drouth, when all other graſſes have been burnt up by the exceſſive dryneſs of the ſeaſon. I have at one cutting got two tons of this hay per acre.

Cold, clay, or wet land is not ſuitable for this graſs, as it would chill and rot the roots. The long root of ſaintfoin, has near the ſurface, many horizontal roots iſſuing from it, which

which extend themſelves every way; there are of the ſame kind all the way down, as the roots go, but they grow ſhorter and ſhorter all the way.

Any dry land may be made to produce this valuable and uſeful plant, though it be ever ſo poor; but the richeſt and beſt land will produce the greateſt crops of it.

The beſt method of ſowing it is by drilling, but the earth muſt be very well prepared, and the ſeed well ordered, or elſe very little of it will grow. The heads of theſe ſeeds are ſo large, and their necks ſo weak, that if they be above an inch deep, they are not able to riſe through the incumbent mould, and, if they are not covered, they will be malted; that is, it will ſend out its root while it lies above ground, and be killed by the air.

The beſt ſeaſon for planting it is the beginning of ſpring; and it is always ſtrongeſt when planted alone.

If barley, oats, or any other grain ſown with the ſaintfoin, happen to be lodged afterwards, it kills the young ſaintfoin. The quantity of ſeed to be drilled or ſown broad-

caſt

caſt upon an acre of land will depend wholly on the goodneſs of it; for there is ſome ſeed, of which not one in ten will ſtrike; whereas, in good ſeed, not one in twenty will fail. The method of knowing the goodneſs, is by ſowing a certain number of the ſeeds, and ſeeing how many plants are produced by them. If it is above two years old, it will not grow. The external ſigns of the ſeeds being good, are, that the huſk is of a bright colour rather of a purple, and the kernel plump, of a light grey or blue colour. If the kernel be cut acroſs, and appear greeniſh and freſh, it is a certain ſign it is good. If be of a yellowiſh colour, and friable, and looks thin and pitted, it is a bad ſign. The quantity of ſeed allowed to the acre in the drill way, is much leſs than by ſowing broad-caſt. A buſhel of ſeed to an acre of land, is 20 ſeeds to eack ſquare foot of land if ſown broad-caſt, which would be ſufficient; but there muſt be an allowance made for caſualties.

The quantity of good ſeed I have found by experience is, for ſowing broad-caſt, two buſhels, and for drilling, one buſhel. And as the ſaintfoin does not cover all the ground the firſt year, which ſpaces are generally occupied by weeds; to remedy this, when I have ſown it broad caſt, I have ſown four or five

five pounds of clover ſeed with it to the acre, which has anſwered a very good purpoſe, as I have then had a crop the firſt year.

The Saintfoin is but a ſlow grower at firſt, the ſecond year perhaps will not exceed a clover crop, but afterwards it increaſes every year, for ſix or ſeven years before it comes to its full perfection; and as that increaſes, the clover goes off, and makes room for it.

This valuable plant will keep in perfection for twenty years, if you only give it a ſlight top dreſſing with ſoot or aſhes, once in four or five years. The firſt ſummer, nor early the next ſpring, it ſhould not be fed, becauſe it will be apt to bleed itſelf to death: for the ſweetneſs of it is ſuch, that it will entice cattle to bite into the knot in the ground and ſpoil it; but afterwards, when it has gathered ſtrength, the beſt method will be to mow the firſt crop, and feed it after, which is excellent for cows and ſheep.

This plant, as well as trefoil, will not thrive in a wet moiſt ſoil; and as ſaintfoin thrives beſt on high grounds, it is a great advantage in the article of making it into hay, as it has greatly more advantage of the ſun, and leſs to fear of miſchief from wet, than graſs

graſs which grows in low grounds.—On the high grounds, the wind will dry more in an hour, than it will in meadows that lie low, in a whole day ; and often the crops of ſaintfoin make a very good hay in the ſame ſeaſons in which all the graſs hay is ſpoiled. The ſun on the high grounds has alſo a more benign influence, and ſends off the dew there, two hours earlier in the morning, and holds it up as much longer in the evening ; by theſe advantages, the ſaintfoin has more time to dry, and is made with half the expence of common hay.

Saintfoin for hay, ſhould be cut when it is half bloſſomed, and managed the ſame, as before directed for clover. If ſaved for ſeed, it muſt be the firſt cutting. You may know when it is ripe by the ſeeds coming out eaſily in your hand ; dry it in the field, and threſh it there on a cloth, as it will ſhed, and you will looſe great part of the ſeed if you carry it to the barn. The ſtraw will be as good as hay for horſes ; and the hay, when it has been well got in, my horſes that have worked hard, have been kept on it alone without any grain, have been ſo fond of it that they have refuſed beans and oats mixed with chaff in the common way for it. Sheep alſo will be fatted in pens in winter, with only

ly this hay and water, better than with corn, peas, oats, and the like. In ſhort, there is no hay that is made, is equal to it, and the produce will be double that of clover. The land where it is ſown ſhould be very clean from weeds, under a fine tilth; which is beſt done by a turnip fallow.

LUCERNE,

Is the ſame plant which the ancients were ſo fond of, under the name of Medica, and in the culture of which they beſtowed ſuch great care and pains. Its leaves grow three at a joint, like thoſe of the clover; its flowers are blue, and its pods of a ſcrew like ſhape, containing ſeeds like thoſe of the red clover, but longer, and more kidney ſhaped, and the colour all yellow. The ſtalks grow erect, and, after mowing, they immediately grow up again from the parts where they were cut off. The roots are longer than the ſaintfoin, and are not ſingle, but ſome times they run perpendicularly, in three or four places from the crown.

It is the only plant in the world, whoſe hay is equal to the ſaintfoin for the fattening of

of cattle; but its virtues in that reſpect are very great. It is the ſweeteſt graſs in the world, but muſt be given to cattle with caution, and in ſmall quantities, otherwiſe they will ſwell, and incur diſeaſes from it.

Though the common methods of huſbandry will not raiſe lucerne to any great advantage, yet the drilling and the horſe-hoe huſbandry will raiſe it, annually increaſing in value to the owner, and make one of the moſt profitable articles of his buſineſs.

The ſoil to plant it on, muſt be either a hot gravel, or a very rich and dry land, that has not an under ſtratum of clay, and is not too near ſprings of water. The natural poorneſs of gravel or ſand, may be made up by dung, and the benefit of the hoe, and the natural richneſs of the other lands, being increaſed by howing and cleanſing from graſs, the lucerne will thrive with leſs heat; for what is wanted in one of thoſe qualities, muſt be made up in the other.

The beſt ſeaſon for planting of it is early in the ſpring, the earlier the better; for then there is always moiſture enough in the earth to make it grow, and not ſo much heat as would dry up its tender roots, and kill it after

after the firſt ſhootings. About a pound and an half of ſeed will be enough for an acre.

The planting it in autumn, in ſome climates, might do; but here the winters are too cold, which would kill great part of the tender plants, and greatly ſtunt and injure thoſe it does not kill. The number of the lucerne plants ſhould be leſs than thoſe of ſainfoin, to an acre, becauſe they grow much larger in this way of management, and each occupies a greater ſpace of ground, and produces a larger quantity of hay.

The quick growth of this plant, requires that it ſhould have large ſupplies of nouriſhment, and good room to grow in; and it is better in all things of this kind to err in ſetting the plants too far diſtant, than in ſetting them too near.

The moſt fatal diſeaſes incident to lucern, are ſtarving and ſmothering; for this reaſon, good cultivation is neceſſary to it, and the often turning the earth with the hoe all about it. By this means, a plant, that in the common way of ſowing, would not have been more than eight or nine inches high, will be four or five feet, and will ſpread every way,

ſo as to produce a quantity of hay, more like the cutting of a ſhrub, than a plant.

The plants ſhould ſtand at five inches diſtance in ſingle rows, and the intervals between theſe rows, muſt be left wide enough for the uſe of the hoe plough, (if managed according to the horſe-hoe huſbandry;) but if hand hoed, one foot between the rows will do: for which I will refer you to my experiments on fallow crops, where you will find, that by this method, I had at the rate of four tun of lucern hay per acre. But lucern ſown in drills ſo near, will in a few years, meet in the rows, which will hinder the mould being ſtirred, when it will ſtarve for want of nouriſhment, and thereby wear out.

Lucern is of much quicker growth than ſaintfoin, or any other graſs. I have cut it four times in a ſeaſon; whereas the others are ſeldom cut above twice.

Lucern is to be made into hay, the ſame as ſaintfoin or clover; but this muſt be obſerved, that it is always to be cut juſt before it comes to flower. It is a fine food, if cut for the cattle green, it is ſo ſweet and full of nouriſhment:

nourishment: but it must be kept clean from natural grass, as that soon choaks and kills it.

RYE-GRASS.

Rye-grass, when young in the spring, is proper for fattening of horses or beasts, and is of very great advantage for milch cows, as it causes an abundance of milk, making excellent butter and cheese, and is of great service for ewes and lambs, or to feed any large cattle in the early part of the season, before clover and the other grasses come in; it being much more quick in growth than they.

As for the soil, clay, or any other sour and uncultivated land, is proper for it; nor it doth not take so much tillage as other grass seeds do, growing well amongst the most stubborn clods that lie in the way: on which account, where any person has any cold sour lands, they cant be better employed than in such a way; it being always to be observed, that those lands which will not suit clover, trefoil, saintfoin, or lucern, will well suit this grass. It will last some years, and for the feeding of cattle, it is of great advantage, as well as the great bulk of hay it makes, which is double that of common grass; but if it should

ſhould be a dry ſummer, there will be but a ſhort crop in the fall. Being ſown in the fall, it will be fit to graze the following year, for horſes and beaſts, without danger of making it bleed.

If this ſeed be ſown on land entirely devoted to it, and on which, in all probability, no grain, at leaſt but little, will grow; then two buſhels of ſeed is the leaſt that can be ſown there.

Although rye-graſs is proper to be ſown upon cold, coarſe, auſtere ground only, I have frequently ſeen it admitted into lands whoſe ſoil was ſuitable for the other more valuable graſſes, which would have been much more advantageous.

I have frequently ſown rye-graſs, mixed with clover ſeed, with my ſpring grain. The quantity has been one buſhel of rye-graſs, and ſix-pounds of clover ſeed, by which I have found great benefit, as it has greatly increaſed the bulk of hay; and when I have fed it, has prevented the pernicious effects that clover has alone.

Rye-graſs ſeldom wants any aſſiſtance, till after it has been ſown two or three years; when

when it does, you may dreſs it with ſhovellings of ſtreets or roads, or earth dug from the ſides of roads, or any compoſt what-ever.

The hay of rye-graſs muſt be cut and managed as common graſs hay.

TIMOTHY-GRASS,

Is a ſpecies of graſs, ſomething like rye-graſs, and makes the beſt hay and the greateſt quantity of any known at preſent in this country. It is ſuppoſed to be a native here. I cannot find any author, that has given any account of it. The beſt time for ſowing the ſeed is from the middle to the latter end of Auguſt. A moiſt rich land will produce from two to four tuns of hay per acre; one peck of clean ſeed is ſufficient to ſow an acre, ſome ſow it with grain, but the beſt method is to ſow it by itſelf.

BURNET.

Burnet is a hardy graſs, and will ſtand the froſt and ſeverity of the winter, better than any other; and like rye-graſs makes an early paſture, it being of a quick growth. It will

will grow on any ſoil, but a loam ſuits it beſt. The land intended for it, ſhould be brought into a fine tilth; from 16lbs to 20lbs of ſeed is ſufficient for an acre. The ſeed muſt be covered with a very light harrow, and the ground rolled; the time for ſowing it is from April till September. It ſhould be mowed but once the firſt year.

The time for mowing of it (if not ſaved for ſeed) ſhould be when in full bloſſom. When the ſeeds of the plant are to be ſaved it muſt be neither fed or mowed in the ſpring. The ſeed will be ripe about the middle of June, when it muſt be reaped like wheat, and threſhed on a cloth, before it is too dry, becauſe it is apt to ſhed, and it ſhould afterwards be dried perfectly. It does not loſe its leaves in drying; and though the hay made of it be ſticky, it will after threſhing be very agreeable to horſes, which are ſo fond of it, that they never waſte any. The ſeed is ſo nouriſhing that it fattens them preſently. I have had from one acre upwards of three tuns of hay and above forty buſhels of ſeed.

The before mentioned graſſes may all be ſeen growing at the author's place of reſidence.

UPLAND

UPLAND MEADOWS.

For upland meadows that are ſown with common graſs, the land ſhould be rich and good; and before it is lain down, ſhould be well cleaned from weeds, and brought into a fine tilth; which is beſt done by a crop of turnips or potatoes.

When the land is prepared, there is a caution very neceſſary, that is, to be very particular in your ſeed, that it came from a clean meadow; for if you ſow ſeed that came off a foul piece, you will fill your meadow with weeds and couch graſs, which will ruin your land. Two buſhels of graſs ſeed will be ſufficient, mixed with three pounds of white clover ſeed, and three pounds of trefoil ſeed. It may be ſown in the fall, or early in the ſpring. If ſown in the fall, it ſhould be done the latter end of Auguſt, or the beginning of September, that the graſs may be well rooted before the froſt ſets in, which is apt to turn the plants out of the ground, when they are not well rooted.

This

This ſeed ſhould be ſown, in moiſt weather. The following ſpring, if there ſhould be any troubleſome weeds come up among the graſs, they ſhould be carefully cut up with a ſpaddle before they grow large; and this ſhould be repeated two or three times in the ſummer, which will effectually deſtroy them.

LOW OR WATERED MEADOWS.

Low or watered meadows require the ſame management and precaution as the upland. I have often ſeen good meadows ſpoiled by improper treatment, ſuch as flowing the low grounds all the winter, whereby the roots of all the ſweeteſt kinds of graſs are deſtroyed, and only ſuch graſſes left, as are natives of marſhes, which are coarſe and ſour; and, if people were curious to examine the herbage of theſe water-meadows, they would find the bulk of them compoſed of bad weeds, ſuch as grow by the ſides of rivers, brooks, and ditches. The ſeeds of thoſe obnoxious weeds falling into the waters in the autumn, are carried by the ſtream, and depoſited on the land, where they grow, and fill the ground in every part: but ſo incurious are the generality of farmers in this reſpect, that, if the ground is but well covered, they care not

not what it is; few of them ever taking any pains to weed or clean their paſture.

The method which I propoſe for the management of theſe meadows is, never to flow them till the middle or latter end of March; and after the hay is carried off the ground, no cattle ſhould be turned into the meadows, till the ſurface of the ground is become firm; for otherwiſe the graſs will ſuffer more from the treading of the cattle, than it will receive benefit by the flowing. Another great improvement of theſe lands might be procured by rolling them with a heavy roller in ſpring and fall. This will preſs the ſurface of the ground even, whereby it may be mown much cloſer; and it will alſo ſweeten the graſs.

A compariſon of different methods of farming, in the different counties of England.

The county of Hertford is allowed by the exacteſt obſervators, to be a moſt healthful ſituation, abounding with red clays, loams, chalks, gravels, and ſands, that lie in many hills and a few vallies, which are moſt of them naturally poor ſoils of themſelves, but of late greatly improved by the induſtry of

its farmers,who living within a day's journey of London, many of them have been encouraged to employ their teams at vacant times to carry meal, bran, chaff, grain, wood, and other vendables thither, in order to load back again with ſoot, aſhes, hoofs, horn-ſhavings, rags and other manures for dreſſing their land, and by the help of theſe and good plowing,many have the benefit of grain,graſs, turnips, &c. yearly, without the loſs of one ſummer for the fallow ſeaſon ; which of late has become ſo profitable, that the hilly farms let for more than the vale ground, that are in themſelves richer than the hilly lands, being a black mould mixed with a bluiſh clay, that will with half the dreſſing return the moſt plentiful crops of wheat, barley and beans ; but then there is this difference in the hill country, they have ſometimes three crops in leſs than a year and an half ; as clover, turnips, wheat or barley ; or elſe, peas turnips, wheat or barley, &c, by means of their convenient incloſures ; whilſt they in their valley open fields, are confined to loſe a year and an half, before they muſt ſet on a barley crop after their beans. They are not under the neceſſity of much brain work to ſtudy the improvement of their land in their open fields becauſe every farmer acts commonly as his neighbour does, and that year after year in one

one and the ſame ſort of management. For if they would do otherwiſe, they are hindred by the want of incloſure: ſo that in the open vale ground the ſcience of farming is as eaſy and plain, as it is hard and difficult in the hilly lands, where an acute farmer is obliged to form a plan of his future proceedings three years at leaſt before hand, that each crop may ſucceed one another in ſuch order as to impoveriſh the ground as little as poſſible; not but both vales and hills vary much in many places, in the ſeveral ways of huſbandry.

In Bucks, Berks, Bedford, Oxford, Worceſter, Glouceſter, Hereford and Somerſetſhire, in the vale parts, ſome fallow their ground every third year; others every fourth year; ſome ſet their horſe beans with a dibber, ſome drill them, and others ſow them broad-caſt, and plow them in. Some plow up their ſward or graſs ground, and ſow wheat, which they ſell at an extraordinary price, as coming off freſh earth, or virgin mould, which the hilly farmers buy for the ſake of the change of ground, and being clean from the ſeeds of weeds and other trumpery.

In the hilly parts they cut up their turf or peat, and burn it to aſhes to dreſs their ground with.

with. Here they drill and hoe their hog-peas. Some again follow the ingenious Mr. Tull's way of drilling in wheat, and other grain, and graſs ſeeds, in order to ſow the interſpaces the next year that lay vacant the preceding; which is a good way, and would anſwer in this country if the charge of hoeing could be avoided; but that is ſuch an expenſive article, as will not ſuit the farmers mind nor pocket. The method alſo of drilling in horſe-beans at ſix feet diſtance, has been practiſed, and the hoeing part ſupplied by the plough; but the attempt proved unſucceſsful, becauſe as they managed it, the weeds came up and choaked the beans. If a proper method had been made uſe of, I am confident, from my own experiments, it would have anſwered very well.

In Cornwall, Devonſhire, and ſeveral other maritime countries, they dreſs with ſea ſand oar-weed, ſea mud or vaes, ſhells and ſometimes fiſh; as I knew it once done in Cornwall, where there were ſuch numbers of pilchards affrighted to the ſhore by the porpoiſes, that ſeveral laid them on their lands, and afforded a great improvement by the oily, ſulphurious parts of the fiſh.

In

In Cambridgeſhire, Northamptonſhire, &c. ſeveral make uſe of rape-canes, ground at the oil mills into powder, which is of great ſervice to their land.

In Berks, and the hilly parts of Bucks, ſeveral ſow them for their cattle.

In Eſſex, Suſſex and ſeveral other counties, they ſend from ten to twenty miles for lime to manure their ground with, as they do in Herts &c. with chalk, rags, horn-ſhavings, ſheeps trotters, hoofs, hair, aſhes and ſoot.

In Surry, Suffolk, and many other places, the marle-pits excel, as well as others, that dreſs their clays with ſand, and ſands with clays. The marles in Warwickſhire and Northamptonſhire are of two colours, red and blue; the red is as hard as an earth floor, which obliges them to dig it out of the pits with mattocks and crows of iron; from thence they lay it in heaps in their fields, and in three or four nights time, its ſmall pieces and bits, will ſhoal by the help of the dews and rain in Auguſt and September. The blue ſort being ſofter, is much eaſier managed.

In

In Surry, Kent and Berks, their French wheat is a great improvement, by being plowed in to dreſs their ground. In Middleſex ſeveral do the ſame by their clover.

In the vales, their way of cleaning wheat and other grains, is very different from theirs in the hills; the former following their ancient way of wind-fanning it; the latter, by throwing it, which is done with as much expedition and with fewer hands.

Their hedging in the low countries varies much from that of the high lands; in the low countries they cut half the ſide of the hedge for fuel, and leave the other half for fence: but in the hilly countries they plaiſh all that is left, and make a ſort of a wall-hedge, about four feet high from the ground, which makes an excellent fence, far exceeding the other.

In the vales, their wheat and beans are larger bodied than thoſe on the hills, by reaſon of their excellent, ſtrong black ſoils; but their barley and oats are not ſo good, becauſe their ground is ſo rank as runs them moſtly into ſtraw, and leſs into grain, that often lays them flat to the ground, by the greatneſs of their bulk, and then it is generally lean, poor grain.

In

In Kent, their ploughs that have two broad boards, are excellently well adapted to the culture of their hilly grounds, becauſe they turn a thorough or furrow all one way, and thereby leaves no bendings as the wheel Hertfordſhire plough does; which renders them very uſeful in turning the ground from the lower part towards the upper part; —But there is a new invented double plough anſwers extraordinary well, eſpecially in barley and turnip ground, and in ſterile ſeaſons; for then there may almoſt double work be done in half the time that a ſingle plough is employed; and thus to ſave time and labour in thoſe ſeaſons when the farmer's great benefit lies in expedition, muſt certainly be of great value.

In the vales, they are in many places under the misfortune of having rotten ſheep, by their watery ſituation, and looſe ſticky earth, that eaſily waſhes about the graſs, and communicates a poiſonous quality into the blood, which ſweeps away thouſands in a year. To prevent ſuch diſaſters in this country, I have given receipts in this treatiſe to prevent and cure the rot, and the red water; as well as other diſeaſes, which if properly attended to, I am confident will be efficacious from my own experiments.

For

For RAISING *the* TURNIP, *and preventing the* FLY *taking them.*

Firſt, to prepare the land to receive the ſeed. The ground ſhould be broken up in the fall if new ground, if old ground, under grain, the ſtubble ſhould be plowed in as ſoon as poſſible after harveſt, and lay in that ſtate all winter; in the ſpring as ſoon as the weather will admit, give it another plowing croſsways; in about a month give it a good harrowing: in June carry on your dung, for if it is old land, it muſt have a good dreſſing.

The ſeed may be ſown from the latter end of June to the latter end of July; the beſt method is to ſpread the dung as you plow: then plow it in, and ſow as you plow: that is, what you plow in the morning, ſow in the afternoon; the land ſhould be harrowed twice in a place before you ſow; then ſow and harrow it in. One pound of ſeed would produce plants enough for an acre; but it is better to ſow two pounds; for it is better to have too many plants than too few.

Steep

Steep the ſeed in oil for twelve hours; fiſh oil is the beſt. When you ſow, drain the oil from the ſeed, and mix the ſeed with duſt or dry ſand to ſeparate it. The oil makes the ſeed quickly germinate, and makes the plants healthy and luxuriant, which prevents the fly from making ravages among it; for all flies attack the ſickly plants, the healthy outgrows them: it is when it is in its ſingle leaf they do the damage; when it is in the rough leaf, it is out of danger.

I have ſown large fields from twenty to thirty acres, and the fly has deſtroyed them. I have ſown again and again, and they have done the ſame, which induced me to try experiments. I have mixed the ſeed with brimſtone, ſoot, aſhes, &c. I have ſteeped the ſeed in lyes, urines, &c. but found none ſo efficacious as oil, which I found never to fail.

When the plant is ſtrong, juſt before it begins to bottle, let them be well harrowed landways and acroſs, and when they are bottled as big as a raddiſh, give them a hoeing, to free them from weeds, and cut up all the ſuperfluous ones; and leave them at proper diſtances, which is from nine to twelve inches. Light land ſuits them beſt, and by obſerving

the above rules, you may depend on a good crop.

FEEDING AND FATTENING SHEEP ON TURNIPS.

Feeding ſheep with turnips is of great advantage to the farmer, as they ſoon fatten on them, and their dung is of great ſervice to the land; and it would likewiſe be a national benefit, if it was made a common practiſe of, as in Great-Britain; for by this method there might be a hundred ſheep kept on a ſmall plantation, where now they have not above ten.

The meat that is fatted with turnips, is ſuperior in flavour to that fattened on the beſt meadows; and by the increaſe of the ſtock, our wool would be ſufficient for our manufactories, which at preſent the greateſt part we are obliged to import.

In Great-Britain, they reckon turnips the baſis of agriculture: therefore if a farmer there keeps no ſheep, they predict his deſtiny.

There

There is ſome difficulty at firſt to make ſheep that has not been uſed to them, eat them ; they will ſometimes faſt two or three days ; but after they have taſted them, they devour them voraciouſly—the young lambs fall to at once.

To turn a flock of ſheep at large into a field of turnips, would be very diſadvantageous, for they would deſtroy as many in a fortnight as would keep them the whole winter.

There are three other ways of feeding them on this food, all of which have their ſeveral advantages. The firſt way is to divide the land by hurdles, (a deſcription of which I ſhall give hereafter) and allow the weathers, ewes and lambs you intend to fatten, to come upon ſuch a portion only at a time, as they can eat in one day, and ſo advance the hurdles further into the ground daily, till all be eaten. They will eat the tops, and ſcoop out the middle of the turnip ; what is left, the bottoms and out ſides, ſhould be picked up with an iron crook, and given to your ſtore ſheep, which may follow thoſe you are fattening, and they will eat all clean up.

The ſecond way is by encloſing the ſheep in hurdles as before ; but to pull up the turnips

nips you ſuppoſe the ſheep can eat in one day, and ſo on till all be eaten.

The third manner is to pull up the turnips, and remove them in a cart or waggon to ſome other place, ſpreading them on a freſh place every day; by this method the ſheep will eat them up clean, both roots and leaves. The great advantage of this method is when there is land not far off that wants dung more than that where the turnips grow, which perhaps is alſo too wet for the ſheep in winter. The expence of hurdles, and the trouble of moving them, is ſaved in this caſe, which will counterbalance at leaſt the expence of pulling and carting the turnips.

There is one caution neceſſary, that is, to houſe or bury a quantity of turnips, in caſe it ſhould happen to be a ſevere winter, that your ſtock may not ſuffer. I have frequently obſerved, when the ſnow has been a foot high, that the ſheep have ſcraped off the ſnow, and found the turnips.

For making the hurdles, and placing of them; with the benefit received by the ſheep's dung and urine.

The hurdles are made of thin light poles, ſplit in two, any wood will do that will rend eaſy; the common length of the hurdle is eight feet; it is made like a gate, with five bars or ſlotes. There are two ends mortiſed, that the ends of the bars, or ſlotes go into: the feet of thoſe ends are eighteen inches long, cut peaked or ſharp to go into the ground: then there is a flat piece that is nailed to the bars right in the middle horizontally, andtwo other flat pieces which are alſo nailed to the bars, in a ſloping manner as ties; they go from the feet on each ſide up to the top of that piece nailed in the middle, which keeps the hurdle from rakeing. The height of the hurdle is four feet; if they are made of light ſtuff, a man can carry four of them. For placing of them, there are holes made in the ground with a ſharp iron crow, for receiving the feet of the hurdle, which is drove down with a wood-maul, and the ends are faſtened together with withes: for fifty ſheep, place five

five hurdles on every ſide, ſo that forty feet ſquare will be ſo taken in, and ſo in proportion according to the flock. A man, when he has been uſed to this work, will remove one of theſe pens in an hour.

There are many other benefits received by folding of ſheep excluſive of feeding off the turnips. In many parts of England they fold upon their wheat. Every day they plow for wheat, they ſow broad-caſt and harrow it in. Their flock every night is brought from the paſture and folded on it: the ſheep tread the ground down firm that it does not ſpew out in the winter, and their manure makes it grow vigorouſly, that they have generally great crops.

Sheeps dung is one of the beſt manures I know of. It ſucceeds upon all ſorts of lands; but as it is not ſo conveniently collected as the dung of larger animals, it is commonly conveyed to the land it is intended for, by folding the ſheep upon it. The urine as well as the dung, is thus given to the land, and is of great advantage.

In Flanders, they make many thouſand loads of manure annually from their ſheep: they cover the bottom of the folds conſidera-

bly

bly deep with ſome light and ſpungy earth, and when this has received the dung and urine of the animals for ſeven or eight days, they remove it and lay freſh in its place: the earth thus impregnated, becomes an excellent improvement to land, and they raiſe large crops by means of it, in places where very little could be expected without it. I have myſelf had contrivances ſomething like it, which was covering the bottoms of the folds deep with ſand, and changing it once a week; which I found was an excellent dreſſing for my clayey lands; both the ſand and this peculiar kind of dung being appropriated things for it.

I hope the foregoing hints and experiments will open the farmers eyes, and make them attentive to their intereſt, by increaſing this uſeful animal.

The MANGEL WURZEL; *or*, ROOT OF SCARCITY.

This root is a native of Germany, from whence it took its name Mangel Wurzel, or root of ſcarcity. Its cultivation in that country is great, for the uſe of all ſorts of cattle, as well

well as for culinary uſes. It was introduced into France, and from thence to England by that ingenious horticulturiſt, John Coakley Lettſom, whoſe laudable endeavours to encourage the growth of ſo valuable a root, did not meet with that encouragement it deſerved, as it interfered with the profits and intereſts of ſome oppulent gardeners, who would at any time ſacrifice the public good to their own private emolument.

What makes this plant more valuable is, that every part of it is edible and ſalutary; and beſides allowing nutritious fodder for cattle, affords a ſupply for the table both in ſummer and winter. The leaves exceed ſpinach, and the roots thoſe of parſnips. The ſtalks and ribs of the large leaves, diveſted of the leafy part, and peeled, eat like aſparagus; or may be uſed in ſoups, which they greatly improve. The leaves tied up in a bag or net, with ſlices of meat interlaid and boiled, make a diſh both pleaſant and ſalutary; or with plumbs, damſons, ſliced apples, quinces, &c. afford a diet that is highly eſteemed by many.

This root ought not to be put into the claſs with turnips, or carrots, although by its external appearance, and its ſeed, it very much reſembles

reſembles the beet root; it is ſuperior to it in every reſpect, and appears to form a diſtinct ſpecies. Its culture is ſo eaſy, its advantages ſo numerous, and it will anſwer ſo completely the purpoſes of any other fodder, that it ſeems to me to deſerve to be adopted every where, and to have the preference even in the beſt years, over all other roots with which beaſts are nouriſhed. It will grow in all climates and ſoils. Thoſe lands that are moiſt and light are moſt ſuitable. If in hard and clayey grounds, it is prevented from making its way far into the earth, it will extend itſelf horizontally, and will produce above the ſurface that which the nature of the ſoil hinders from being produced beneath it.

This moſt valuable root is not affected by the viciſſitudes of the ſeaſons, and has no deſtructive enemy; the inſects and vermin which make ravages on all other kinds of vegetables, neither touch nor injure it. It is not attacked by blaſting or mildew, and the greateſt drought does not affect its vegetation; it does not injure the ſoil that nouriſhes it; but prepares it to receive, before the winter, the grain and other ſeeds that are intended to be depoſited in it.

The time of ſowing the ſeed is in April or the beginning of May; let the land be well prepared by plowing, and manured, and made light; ſteep the ſeeds in water twenty-four hours; lay the line upon the field, and plant the ſeeds at eighteen inches apart every way; you may ſet them with a ſtick, but they muſt not be buried above one inch deep. After ten or twelve days, it will be up, and every grain will have from two to four roots growing together. As ſoon as theſe ſmall roots ſhew their fourth leaf, the feebleſt of them muſt be carefully plucked off, and the fineſt and moſt vigorous root only left.

In a little time the growth of the roots thus ſelected will be aſtoniſhing; not one will fail.

As the roots naturally grow a little above the ground, notice thoſe which do not ſo appear, and bare them by removing the earth from around their top; they muſt be hoed and kept clean from weeds.

In July, when the outward leaves are become about a foot long, the firſt crop of leaves is to be gathered, breaking them off round and near the root. For this purpoſe, the thumb ſhould be placed within, and at the origin

origin of the leaves, in order to ſtrip them off, cloſe to their inſertion into the ſtem. Thoſe leaves only ſhould be gathered which bend towards the earth, and care ſhould always be taken to leave thoſe of the heart of the plant: they will thereby be reproduced, and grow more quickly.

Immediately after this firſt crop, the ground ſhould be ſtirred. It is from this moment that the roots begin to grow large, and to increaſe in an aſtoniſhing manner. In good land the leaves may be plucked off every fortnight or three weeks.

The commencement of ſharp froſts determines the time of the crops of theſe roots: a fine day muſt be choſen for gathering them in, as it is neceſſary they ſhould be got in dry. I have had the roots average ſeven pounds each on an acre. Which produce was fourteen tuns and an half per acre, and the leaves I reckoned weighed as much, which was twenty-nine tun of excellent food for cattle, from one acre of land.

In order to cauſe theſe roots and leaves to be eaten by all kinds of cattle, it is neceſſary to cut them in ſmall pieces, after having well waſhed and cleanſed the roots. I employed

for

for this purpoſe a ſharp inſtrument, made of a blade of iron a foot long and two inches broad, and twiſted into the form of an *S*; in the middle of the two branches of the *S* was ſoldered a ſocket of about two inches long; in this ſocket was fixed a wooden handle of about three feet ſix inches in length; with this inſtrument they are cut with great facility. This operation was performed in a trough made for that purpoſe. A man may in one hour's time cut into ſmall pieces a quantity of roots, ſufficient for the nouriſhment of twelve oxen for a day. Before the roots are caſt into the trough, it is neceſſary to ſplit them, and cut them into quarters.

For horned cattle prepared in this manner, theſe roots, or leaves may be given, without any mixture; but if you want to huſband the roots, you may mix one quarter of chaff with it cut from the hay of trefoil, lucern, ſaintfoin, or clover.

For horſes during the ſummer, they may be fed with the leaves chopped, and mixed half with chopped hay, the ſame as before mentioned, and in the winter with the roots and hay cut in the ſame manner.

Hogs

Hogs will alſo readily eat theſe leaves and roots, when cut ſmall and mixed with any fat or milky drink, which is generally given them. They will become as fat by eating thoſe, as other ſwine will by different kinds of food.

There is one caution neceſſary reſpecting theſe roots, which is to bury them or put them in a good cellar, to hinder the froſt from ſpoiling them.

For RAISING *and* DRYING *of* HOPS.

The principal uſe of hops is well known to conſiſt in preſerving beer from growing ſour, and to make it keep a long time. Hops boiled in the wort alſo makes the beer wholeſomer and more grateful to the taſte, as they communicate to it a diuretic virtue, to purge the blood, and is good for the jaundice and hypochondriac affections. And as it is expected that beer will be the common and general drink of this country, I would adviſe thoſe who are in a capacity, to make plantations as ſoon as they can.

There are four ſorts of hops, the wild garlic hop, the long and ſquare garlic hop, the oval

oval hop, and the long white hop : the two former are not worth propagating ; the latter is more fertile and beautiful.

Any ſoil, except ſtony, rocky, and ſtiff clay will ſuit them ; the beſt however, is that which is light, deep, and rich, and the better for ſand being mixed with it : a black garden mould is excellent. An open ſituation to the ſouth-eaſt and ſouth-weſt points agree beſt with hops, if they are defended with trees planted on the eaſt, north and weſt ſides the better. The ſets may be planted in the fall or early in the ſpring, either in October, March or the beginning of April : as the ſeaſon and climate ſuits. The diſtance of the hills in dry hot ground may be ſix feet ; but in moiſt and rich ground eight feet.

The largeſt ſets are to be choſen from ſeven to ten inches long, with three or four joints each. Theſe are to be ſet in holes about fourteen inches over, and at each corner of the hole and a fifth in the middle, raiſing the earth two or three inches about, leaving two or three joints above the ground.

If the ground be poor, or ſtiff, ſome good mould, or a compoſt of manure and earth, muſt

muſt be laid in the holes, and it is a great expence and trouble in watering of them, that may be ſaved by putting in the bottom of the hole ſome horſe litter or ſtraw, and covering it with mould in the ſhape of a baſon. In the ſummer keep all weeds, between clear with the hoe, and about June twiſt them together, and let them lie, that they may not bear the firſt year, by which means the plants will be much ſtronger. To make good ſuch loſt time, you may plant the interſpaces with garden beans.

In November, either dig or plow thoſe interſpaces, and give the land a dreſſing of rotten dung, cutting the hop vines down to the earth, covering them with fat mould. In March, the ſecond year, if the weather will permit, open the hills and cut away all the new ſuckers, then pole them with twelve feet poles; the third year they are in full perfection, and will laſt about twenty years; one pole will do for the firſt year you pole them, but afterwards they muſt have three poles to a hill, twenty feet long; but do not pole till the ſhoots are ten inches high, making firſt a hole with an iron crow to put the poles in, that muſt be cut three ſquare at their ends.

When

When the vines are about three feet, and all are not taken to the poles, guide the reſt to them, and tie them with withered ruſhes or yarn to the empty poles, and at a proper diſtance therefrom, but not ſo cloſe tied as to hinder their climbing; two or three ſtrings are ſufficient for a pole. The poles are to lean outwards, particularly towards the ſouth, to receive the ſun's beams; it being obſerved, that a leaning pole will bear more hops than an upright one.

About mid-ſummer, when the hop begins to branch out, ſuch as have not got up to the tops of the poles, ſhould have their heads nipt off, or elſe diverted from the pole, in order to branch the better, for the increaſe of the hop. They blow in July, and are ripe in Auguſt: their ripeneſs is known by their fragrancy, change of colour, by being eaſily pulled, and by the browniſh colour of the ſeed.

Hops ſhould be gathered when ſomewhat browniſh, and that without delay. In order to this, make a frame with four ſhort poles or ſticks, laid on four forks driven into the ground, to contain a hair cloth, or blanket tacked round it about the edges. On this device, the poles with the hops may be laid, and

and at each ſide the pickers may ſtand and pick the hops into it. When the blanket or hair-cloth is full, untack and carry it away, and place it, when emptied, into the ſame frame again; and this frame may be removed to ſome new place of the garden.

Hops ſhould not be gathered when wet; but if dew or rain be on them, ſhake the poles, and they will dry the ſooner. As faſt as the hops are picked, they muſt be dried. The general expeditious way of drying hops, is by the kiln, which extracts their humidity in a little time; but then ſuch violence is not ſo natural as the heat of the ſun, that is the beſt of all other ways, where conveniency will allow; for the ſpirituous parts of this plant are ſo nice, that it cannot endure any violent heat without prejudice to its fine virtues, that are of a friendly, opening quality, when its aromatick, ſubtle ſpirits are thus moſtly kept in.

If they are kiln dried, the common one in a hair-cloth is not ſo proper as one made of a bed of flat ledges, an inch thick, and two or three inches broad, ſawn and laid acroſs each other, chequer ways, the flat way, about three inches diſtant; the ledges ſo entered, are put into another, that the floor may be even and

ſmooth: this bed may reſt on two or three joiſts, ſet edgeways; then covered with large double tin plates ſoldered together at each joint, and order the ledges ſo, before they are laid, that the joints of the tin may always lie over the middle of a ledge: then fit boards about the edges of the kiln, to keep up the hops, only let one ſide be to remove for ſhoving off the hops. They may be very ſafely turned on this tin bed, and with a ſmall expence of fuel; beſides, any manner of fuel will ſerve for this purpoſe, the ſmoke not paſſing through the hops, but conveyances made for it, at the ſeveral corners of the kiln.

After hops have lain a month to cool and toughen, in order to bag them, there is a round or ſquare hole made in an upper floor, big enough for a man to turn himſelf in; then tack a hoop about the mouth of the bag faſt with pack thread, ſo as to bear the weight of the hops and the man that treads them; that done, let the bag down through the hole; the hoop above will keep it from ſliding quite through. Firſt tie a handful of hops at each lower corner, with pack thread, to ſerve as a taſſel, for conveniently moving the bag; then go into the bag, and tread the hops on every ſide, another ſtill caſting in the hops as faſt as you require, till it be full; when it is well trodden and full, let the bag down by

unripping the hoop, and close the mouth of the bag, filling the two upper corners as you did the lower. This bag, if well packed and dryed will keep several years in a dry place; only care must be taken that the mice do not make their nests in the hops.

The profits of a hop-garden per acre, if the blight and fly does not take them, is from thirty to fifty pounds.

How to manage the KITCHEN *and* FLOWER GARDEN.

Some ingenious men have hinted to me that they would wish me to give a botanical description of herbaceous plants and flowers in the Linnæan system, (which I conceive myself fully capable) and should have been happy if I could have obliged my curious patrons; but it would have swelled my work far beyond its limits; and when I consider that my treatise is chiefly intended for the farmer, who has not time to study so laborious a science, which is not like an unactive and sedentary science, like geometry or history that may be acquired by a recluse and solitary application, within the narrow precincts

cincts of a cloſet ; or, like chemiſtry, anatomy, and aſtronomy, requiring only ſuch operations as may be performed without a great deal of exerciſe, toil and fatigue.

The botaniſt muſt wander over mountains and vallies, range the gloomy foreſts and wilderneſs, climb the ſteepeſt rocks, and expoſe his life to the brinks of hideous precipices, in queſt of knowledge.

I ſhall therefore confine myſelf at preſent, to the cultivation and management of the moſt uſeful vegetables for the table, and herbs for the houſe, with theſe flowers that will require the leaſt trouble.

To the curious in botany, I recommend the peruſal of ſome of the beſt authors on that ſcience, which are Boerhaave, Grew, Bradley, Miller, Dillenius, Linnæus, and Sir Hans Sloane.

Mr. Humphry Marſhall has given a very good deſcription in the Linnæan ſyſtem of foreſt trees, and ſhrubs, natives of this country, and promiſed in the introduction to his work, that if the work then publiſhed, met with the encouragement of the public, he would alſo treat on our native herbaceous plants.

plants. By his ſilence I fear his work did not meet with that encouragement it deſerved. I hope I ſhall never find this country ſtigmatized for not giving encouragement to merit, and genius.

I have only to ſay (like Marſhall) if this preſent work meets with encouragement, in my next edition, I ſhall add many uſeful and intereſting ſubjects, particularly in agriculture, horticulture and botany.

The introduction of many foreign ſhrubs and plants into this county, will be of particular benefit. The diverſity of climate and ſoil here, will ſuit any of them. The vine, the almond and fig-tree will grow as well here, and be as productive as in France, Portugal or Spain; only give them proper cultivation. So will liquorice, rhubarb, madder, and many other foreign uſeful ſhrubs and plants.

I ſhall now proceed to give directions for managing the kitchen and flower garden, but ſhall not treat this ſubject as moſt authors have on that ſcience, beginning the calendar January and ſo on; for the ſeaſons are different in this country in the different ſtates. My intention is chiefly intended for the bene-

fit

fit of the farmer: therefore ſhall begin with the proper ſeaſons for ſowing the ſeeds, and ſecondly, how to tranſplant and manage them.

It is firſt neceſſary to prepare the ground to receive the ſeeds and plants, which is beſt done by digging it up in the fall of the year, and laying it up in ridges, which is done by trenching; this meliorates the earth, and then it requires but little labour to make it fit for ſowing, and planting, which is done by throwing the ridges into the trenches and levelling of it; this will enable you to take the firſt opportunity in the ſpring, whereby you will be able to get early crops, beſides having your ground mellow, which will make the ſeeds vegetate in half the time.

To the Southward they have the advantage over the colder parts, as many of their ſeeds may be ſown in the fall of the year as they will ſtand the winter, ſuch as cabbage, colliflower, ſpinach, onions, lettuce, endive, radiſhes, peas, beans, &c. but where the froſt is ſevere, theſe muſt be ſown early in the ſpring.

I will here ſet down alphabetically the different plants to be propagated; firſt the kitchen garden

en garden plants are aſparagus, artichokes, beans, beets, brocoli, cabbage, colliflower, capſicum, cucumbers, coleworts, celery, chervil, carrots, endive, kidney beans, lettuces, melons, muſtard, onions, parſnips, potatoes, parſley, purſlane, peas, radiſhes, rape, ſavoy, ſpinach, ſhallots, ſquaſhes, turnips, turnip-cabbage, water melon. Sweet pot herbs, aniſe, balm, borage, bugloſs, baſil, carraway, chamomile, clary, dill, fennel, hyſſop, lavender, marjoram, marigold, mint, orach, penny-royal, roſemary, ſavory, tanſey, tarragon, thyme.

Flowers, firſt the biennial and perennial: after, apocynum, aſtragalus, aconite angelica, batchelor's button, balm of Gilead, bell flower, Canterbury bells, carnations, cyanus, cyelamen, chalone, columbines, Chriſtmas roſe, clarey, everlaſting pea, golden rod, geranium, hollyhocks, iris, lupins, lilly of the valley, lilly French, polyanthus, peony, pinks, Solomon's ſeal, ſweet William, valerian, violets, wall flowers: the above flowers are propagated by off ſets, layers and ſlips.

The following biennials may be raiſed from ſeed. Auriculas, agremone, aloes, columbines, campanula, French honyſuckle, globe thiſtle, globularia, gentian, holyhocks, horned poppy,

poppy, honeſty, Indian pink, monks hood, nettle leaved bell flower, polyanthus, pulſatilla, roſe campion, rockets, ſtock gilliflowers, ſweet William, ſnap dragon, ſweet ſcabious, tree primroſe, tree mallow, valeran, veronicus.

The following are annuals which come up, flower, produce ſeeds and die the ſame year: African marrigold, amaranthus, baſil, bottle goard, china aſter, chryoanthemum, convoliulus, Capſicum, Chineſe holyhock, French marigold, minionetta, palma chriſti, ſweet ſultan, tree amaranthus, ten week ſtocks, yellow balſom, zennia.

Bulbous and tuberous rooted flower plants. Anemonies, amaryllis, aſphodel lilly, belladonna lilly, crocuſes, corona imperiallis, colchicums, corona regalis, cyclamon, dogs tooth, hyacinths, iris, bulboſa, molly allium, muſcaria, narciſſus, lillies, nauſtrums, jonquils ranunculus, ſnow drops, ſquills, tuberoſe, tulips. Thoſe roots if the climate is not too ſevere, ſhould be ſet late in the fall; but where the froſt is intenſe, they muſt be ſet as early in the ſpring as poſſible.

The ground where the ſeeds are ſown both for flowers and for the kitchen garden, ſhould be

be made rich and very fine: and as I obſerved before, where the climate will not admit of the following ſeeds being ſown in the fall, they muſt be ſown early in the ſpring, ſuch as cabbage colliflowers, coleworts, early cucumbers, celery, carrots, endive, lettuces, onions, parſnips, early peas and beans, radiſhes, ſpinach, ſhallots, aniſe, balm, carroways, dill, fennel, hyſop, lavender, marjoram, marigolds, mint, pennyroyal, roſemary, and thyme.

When the cabbage, colliflower, brocoli, ſavoy, green and bore-cole, and colewort plants, grow ſtrong in the ſeed beds, they may be removed and tranſplanted where they are to ſtand.

The cabbage plants, muſt be ſet two feet apart every way, and kept hoed, and as they grow, the mould ſhould be drawn up to the ſtems.

For the reception of the colliflower and brocoli plants, let a piece of the richeſt ground be choſen, and ſpread thereon ſome good rotten dung, and then dig the ground one ſpade deep, and as you go on let the dung be regularly buried. The plants are to be ſet in this copartment at two feet and a half each way aſunder; and they muſt be watered as ſoon

as they are planted. If the ground is pretty clean from weeds, you may ſow a thin crop of ſpinach on the ſame ground.

The ſavoy, green and boorcole, and colewort plants, may be planted the ſame as the cabbage plants. The dwarf peas may be ſet at two feet diſtance in the rows; but the large high ſorts, that require ſticking, ſhould be ſet at four feet diſtance between the rows. The ſmall garden beans may be ſet at fourteen inches between the rows; but the large broad ſort, muſt be ſet at two feet diſtance.

As there are ſeveral ſorts of peas and beans, as well as cabbages and lettuces, I ſhall enumerate their names. The early ſort of peas, are the charlton hot ſpur, golden hot ſpur, Reading hot ſpur, and maſter's hot ſpur. The others are, nonparel, Spaniſh moratto, the large and dwarf marrowfat. Leadmas dwarf, is of a very low growth, but a plentiful bearer. The brown, green, white, and grey rouncival.

The early beans are the Mexican, Spaniſh, and Portugal. The next are the nonparel, long podded, ſword long pods, Windſor, toker and Sandwich. The late are the white and red bloſſom, and the mumford.

The

The kidney beans, the dwarf ſorts, are the early white, Batterſea, and Canterbury white, red and black ſpeckled, tawny, dun coloured, Chineſe ſpeckled, red, black, brown, and white. The runners are the Dutch, ſcarlet, and the large white.

The cabbages are the ſmall early, the dwarf ſugar loaf, early York, Batterſea, long ſided, large Scotch, large hollow, large drum, and the red Dutch.

The lettuces are the green, white, and red, cos, Aleppo, common cabbage, brown Dutch cabbage, white Dutch, grand admiral, Cilicia, imperial curled, and black Spaniſh. The Brocoli are, the early, and large purple, the brown, green and white. The turnips are the early Dutch, white, common, large white, the yellow, the large red, and green topped, field turnip, the long rooted, and the turnip cabbage.

The cucumbers are, the early, ſhort prickly, ſhort cluſter prickly, the long and white, green Turkey, and Smyrna. The onions are, the Straſburg, the white, red, and ſilver ſkinned Spaniſh; the Portugal, Deptford, and Welch. The raddiſhes are the early ſhort top, ſalmon, Italian, white, and red, turnip rooted

rooted, long rooted white, and large black Spaniſh turnip rooted. The potatoes are the early dwarfs, large round red, large long white, ladies fingers, round white, white kidney, and cluſtered American. And as ſome of thoſe plants require particular management, I ſhall here give proper directions.

Firſt, aſparagus, is a fine vegetable. In making plantations of theſe plants, one great article to be conſidered, is, to make choice of a proper ſoil; chooſe the beſt the garden affords; it muſt not be wet, nor too ſtrong or ſtubborn, but ſuch as is moderately light and pliable, ſo as it will readily fall to pieces in digging and raking, and in a ſituation that enjoys the full ſun.

The ground where you intend to make aſparagus beds, ſhould be regularly trenched, and a large quantity of good rotten dung buried equally in each trench, at leaſt twelve or fifteen inches below the ſurface of the dug ground. The ground being dug and laid level, divide it into beds four feet and an half wide, with alleys two feet wide between bed and bed; four rows of aſparagus are to be planted in each bed, and ten or twelve inches diſtance to be allowed between plant and plant in the row, and let the outſide rows of each

each bed be nine inches from the edge ; the latter end of March or in April, as the ſeaſon is, is the time for planting.

The following is the method: ſtrain your lines lengthways the beds, nine inches from the edge, and then with a ſpade cut out a ſmall trench cloſe to the line, about ſix inches deep, making that ſide next the line nearly upright ; and when one trench is opened, plant that before you open another, placing the plants the diſtance of ten or twelve inches in the row.

In planting theſe plants, obſerve they muſt not be placed flat in the bottom of the trench, but nearly upright againſt the back of the trench or drill, that the crown of the plants may ſtand upright, and two or three inches below the ſurface of the ground, and let them be placed all at an equal depth, ſpreading their roots ſomewhat regular, againſt the back of the trench, and at the ſame time drawing a little earth up againſt them with the hand as you place them, juſt to fix the plants in their due poſition, till the row is planted, then when one row is thus planted, immediately with a rake, draw the earth into the drill over the plants, and then proceed to open another drill or trench as before directed,

plant

plant it in the ſame manner, and cover in the plants as before, and ſo on till the whole is planted. When they are all planted, let the ſurface of the beds be raked ſmooth, and clear them from ſtones. At each corner of the bed, let a firm ſtake be driven in the ground, to ſerve as a mark for the alleys.

The aſparagus being planted, the next care is, when the plants come up, which will be in a month, to keep them clean from weeds, which muſt be well attended to during the ſummer ſeaſon.

Let it next be obſerved, that it will be three years from the time of planting, before the aſparagus plants produce buds large enough for uſe; though ſometimes a few of the largeſt buds may be cut the ſecond ſpring after planting; but I ſhould adviſe to let it be the third year, before you make a general cutting.

A plantation of aſparagus, if the beds are properly dreſſed every year, as I ſhall hereafter direct, will continue to produce good buds for ten or twelve years.

The

The ſeeds for theſe plants may be ſown in the ſpring of the year in rich mould at five or ſix inches apart, and it muſt be obſerved they are not to exceed two years old before they are planted as before directed.

The manner of dreſſing the aſparagus beds is as follows: in October, cut down the ſtalks cloſe to the ſurface of the beds; carry them immediately off the ground; then with a ſharp hoe cut up all the weeds, and draw them off the beds into the alleys. This done, ſtretch the line, and with a ſpade mark out the alleys from about eighteen inches to two feet wide, according to the width they were firſt made. Then dig the alleys one ſpade deep, and ſpread the earth evenly over the beds; and as you advance in digging, let the weeds which were raked off the beds into the alleys, be digged into the bottom, and cover them a proper depth with earth; but when the beds are old they will need an augment of old rotten dung once in two or three years; this is the time to do it, but the manure or dung muſt be applied before the alleys are digged, or the beds landed up.

Every ſpring the aſparagus beds muſt be dreſſed and forked, which is done by ſlightly digging them with a three pronged fork; this work

work ſhould be done very early in the ſpring, before the buds ſhoot out. The beds being forked, they muſt be immediately raked even.

For artichokes, the land muſt be good and well dreſſed with dung. The ſlips or ſuckers ſlipped off from the old plants are the propereſt ſets to plant. There are two ſorts, the large globe artichoke, and the French or green oval; but the former is greatly preferable, the heads being conſiderably larger, and the eatable parts more thick and fleſhy. They ſhould be planted in an open ſituation; plant the ſets with a dibble in rows a yard aſunder, and not leſs than two feet, nor more than a yard diſtant from one another in the row. Give them ſome water immediately after they are planted, to ſettle the earth about the plants.

The above plantation, if kept clear from weeds, and now and then watered in dry weather and in the beginning of the ſummer, will not fail to produce good artichokes the following autumn.

A plantation of artichokes will continue to produce good heads ſix years, and ſometimes longer; but it muſt be obſerved, that if required

red to have a ſucceſſion of theſe fruits for four or five months in the ſummer, ſhould make a new plantation every ſpring; for the old ſtocks which have been planted a year or two or more, produce heads in June and July; and thoſe planted now, produce heads in Auguſt, September, and October.

JERUSALEM ARTICHOKES.

Theſe roots will thrive in almoſt any ſoil, and multiply ſo exceedingly that it is not eaſy to clear the ground of them, for the leaſt bit will grow. The root, the eatable part of this plant, being large fleſhy tubers, bearing ſome reſemblance to a potatoe, but of a more irregular form, and taſtes ſomewhat like the bottom of an artichoke, (hence probably the name) are in perfection in autumn and all the winter, and are very good and wholeſome to boil and eat with butter, &c. Let them be planted in rows a yard aſunder, four or five inches deep, and eighteen inches diſtant in the rows. Obſerve the ſame method in preparing the ſets, and planting them as is hereafter directed for potatoes.

PLANTING POTATOES.

Be careful to procure ſome good ſets, that is, to pick a quantity of the beſt kind of potatoes perfectly ſound, and of a tolerable large ſize: theſe are to be prepared for planting by cutting each root into two, three, or more pieces, minding particularly that each piece be furniſhed with at leaſt one or two eyes, which is ſufficient. Being thus prepared, they are to be planted in rows not leſs than eighteen inches diſtance: if they are to be plowed between, they muſt not be leſs than three feet, and if four feet apart, the more eligible.

The beſt method I have found by experience is to make a trench either with the ſpade or plough, about five inches deep; and putting long dung or ſtraw at the bottom, and laying the ſets on it at their proper diſtances, which is from nine to twelve inches, covering them with mould. They muſt be kept clear from weeds.

PEAS and BEANS, to have a regular ſupply, ſhould be ſown from the firſt breaking up of the winter to the beginning of June.

Thoſe

Thoſe late ſown, the peas ſhould be of the dwarf kind, and the Toker, Sandwich, and the white bloſſom beans are the propereſt.

RADDISHES, ſome of them ſhould be ſown in the fall, as they will grow well at that time.

TURNIPS may be ſown from the beginning of May, till the latter end of July.

GRAFTING AND BUDDING OF TREES.

Grafting may be begun any time after the firſt of March, if the weather will permit. The ſorts proper to begin with are pears, plumbs, and cherries; apples may alſo be grafted at the ſame time, or they may be deferred a fortnight or three weeks longer. It ſhould be obſerved, that where grafting is to be done, you ſhould begin to prepare for it the middle or latter end of February.

The firſt thing to be done towards this work; is to collect the grafts: and it muſt be obſerved theſe muſt be young ſhoots, ſuch only as were produced laſt year; for thoſe that are more than one year's growth never take

take well. Theſe ſhoots or grafts you may begin to cut from the trees from the middle of February, in mild weather, and lay the lower ends of them in dry earth, in a warm border, till the grafting time; and if ſevere weather ſhould happen in the interim, cover them with long litter. The reaſon for cutting the grafts ſo ſoon, is, becauſe the buds will now begin to ſwell faſt; and if the grafts were not to be cut off in proper time, the buds would be too far advanced, and the grafts would by that means, not take kindly with the ſtock, or, at leaſt, not ſhoot ſo freely.

Before I proceed to the methods of grafting, it will firſt be neceſſary to mention what ſtocks are proper to graft the different kinds of fruit upon; for inſtance, apples ſhould be grafted upon ſtocks raiſed from the kernels of the ſame kinds of fruit, i. e. any kinds of apples; for the grafts or buds of theſe trees will not take well upon any other ſtocks.

The time for ſowing the kernels of any ſorts of apples or wild crabs, is either in November or March; but if not ſown till March, they muſt be kept in ſand till that time. Theſe are to be ſown in beds three feet and a half wide, obſerving to ſow them moderately

rately thick, and cover them about an inch at leaſt with earth. The plants will come up in five or ſix weeks, if ſown in the ſpring; and in the autumn or ſpring following, ſome of the largeſt plants ſhould be drawn out and planted in nurſery beds; and in the ſecond or third year after, they will be in order to ground graft on; but thoſe that are for head grafting you may let ſtand four or five years.

Pears are generally grafted or budded upon ſtocks raiſed alſo from kernels of any of their own kinds of fruits; likewiſe upon quince ſtocks, which do very well. Sometimes they are grafted upon white thorn ſtocks; but this is not commonly practiſed, as theſe ſtocks have an ill effect on ſeveral ſorts of their fruit: the ſeaſon for ſowing the kernels of the pears and quinces to raiſe ſtocks, the tranſplanting, and time of grafting, is the ſame as mentioned before for apples.

Cherries are propagated by grafting or budding them upon ſtocks, raiſed from the ſtones of the common black or red cherry, or upon ſtocks raiſed from the ſtones of any other kind of theſe fruit; but the two firſt are moſt eſteemed for that purpoſe, becauſe they generally ſhoot much freer than any other

other. The ſeaſon for ſowing the cherry-ſtones, and the management in every reſpect, is the ſame as before mentioned for apples and pears.

Plumbs are alſo grafted or budded upon plumb ſtocks; that is, ſtocks raiſed by ſowing the ſtones of any of the common ſorts of the ſame fruit; alſo raiſed occaſionally by ſuckers, ſent up from the roots of any kinds of plumb-trees. The time for ſowing the ſtones to raiſe the ſtocks, and the management in every reſpect, is the ſame as the fruits before mentioned.

Thus obſerve as before, let the ſtocks for grafting, both of fruit trees and others, be always of the ſame family or genus as that of the reſpective trees which are to be grafted.

Note, ſtocks raiſed from ſeed, being moſtly of a ſtronger growth, are commonly called free ſtocks.

General

General OBSERVATIONS *for performing the* WORK.

There are ſeveral methods of grafting, but I ſhall only take notice of four, which are practiſed with the greateſt ſucceſs, ſuch as whip-grafting, cleft-grafting, crown-grafting, and grafting by approach or in-arching.

Previous to grafting, you muſt be provided with a proper grafting knife; a quantity of ſtrong baſs-ſtrings for bandages, to tie the ſtocks and grafts firmly together; and ſome well wrought clay, to clay them round over the tying, to ſecure them from the air and wet.

Obſerve that the ſtocks intended to be grafted, muſt previous to the inſertion of the graft, be headed down; which, if intended for ground grafting, muſt be headed pretty low within five or ſix inches of the ground; but if for head grafting, they may be headed at four, five or ſix feet. If ground grafted, you muſt train up one ſtrong ſhoot from the graft for a ſtem, till it is five or ſix feet high, then topped

topped or cut off at that height, to cauſe it to throw out branches to form the head.

FIRST. WHIP-GRAFTING.

This kind of grafting is practiſed with the greateſt ſucceſs upon ſmall ſtocks, from about a quarter or one third of an inch to half an inch, or near an inch in diameter: but commonly prefer ſmall ſtocks of about half an inch or near equal in ſize with the graft; and the method of performing this work is this, have your cions or grafts, &c. ready; then begin by cutting off the head of the ſtock at a convenient height, according to the above rules; this done, fix upon a ſmooth part of the ſtock, where headed off, and there pare off the rind with a little of the wood, in a ſomewhat ſloping manner upwards, about an inch, or near an inch and half in length; then, having the cions cut into lengths of four or five eyes each, prepare one to fit the ſtock as above, by cutting it alſo a little ſloping, ſo as to exactly fit the cut part of the ſtock, as if cut from the ſame place, that the rinds of both may join in every part; then cut a ſlit or tongue about half an inch in length upwards in the cion, and cut a ſlit the

the ſame length downwards, in the ſtock to receive the ſaid tongue; in that manner fix the graft in the ſtock, taking care that the ſap or rind of both may meet, or join as exact as poſſible in every part.

Having thus fixed the graft, let it be immediately tied with a ſtring of ſoft baſs, bringing it in a neat manner ſeveral times round the graft and ſtocks, taking care to preſerve the graft in its due poſition; and let the bandage be neatly tied, and immediately cover the place with ſome grafting clay, obſerving to bring the clay near an inch above the top of the ſtock, and a little lower than the bottom part of the graft, leaving a due thickneſs on every ſide of the graft, and ſtock, making it a roundiſh oval form, and take care to cloſe it well in every part, that no wet, wind, or ſun can enter, to prevent which, is the whole intention of the clay; for without that precaution, the operation would prove fruitleſs; and in this manner proceed with the reſt.

In performing the operation of whip-grafting, ſome grafters firſt cut and prepare the cion, and then cut and fit the ſtocks to that; but it is not material which, provided it be done

done in an exact and ſomewhat expeditious manner.

Next it muſt be noted, that the grafts muſt be now and then examined, to ſee if the clay any where falls off, or cracks; if it does, it muſt be renewed with freſh clay. By the laſt week in May, or firſt week in June, the grafts and ſtocks will be well united, and then take off the clay, and looſen the bandages.

SECOND. CLEFT-GRAFTING.

The next general method of grafting is, that by clefting the ſtock, commonly called cleft or ſlit-grafting, becauſe the ſtock is cleft, and the graft put into the cleft part; and is performed in the following manner:

The proper ſized ſtocks on which this kind of grafting is performed, are generally about an inch, or an inch and an half, and even two inches, or more, in diameter. Firſt, with a ſtrong knife, or ſmall ſaw, cut off the head of your ſtock, and pare it very ſmooth; this done, fix upon a ſmooth part of the ſtock, juſt below where headed, to place your graft, and on the oppoſite ſide to that

that,cut away part of the ſtock,about an inch and an half, in a ſloping manner upwards, ſo as the crown of the ſtock may not be more than about half an inch broad. This done, prepare your graft or cion, which is done in this manner: obſerve to cut your grafts into due lengths, leaving four or five eyes to each; then take your ſharpeſt knife, and pare away the bark and ſome of the wood, at the lower end of the graft, in a ſlooping manner, about an inch and an half, or near two inches in length; and then cut the other ſide in the ſame form, making it to have a wedge-like ſhape; but let one ſide of it, which is to be placed outwards in the ſtocks, be left near double the thickneſs of the other ſide.

The graft being prepared, take your ſtrong knife, and place it on the middle of the ſtock, croſs-ways the top of the ſloped part, and with your mallet ſtrike your knife to the ſtock, obſerving to cleave it no farther than what is neceſſary to admit the graft readily; then place the grafting chiſſel, or ſome inſtrument a little way into the cleft at the ſloped part of the ſtock, to keep it open for the reception of the graft, which then directly introduce into the cleft on the uncut or upright ſide of the ſtock at the back of the ſlope, inſerting

ferting it with great exactneſs, as far as it is cut, with the thickeſt edge outwards, and ſo that the rind may meet exactly every way with the rind of the ſtock.

The graft being placed, then remove the grafting chiſſel, taking care not to diſplace the graft; this done, let it be tied and well clayed in the manner as before directed, in the work of whip or tongue-grafting; or, if in this cleft-grafting, you chooſe to put in two grafts, it may be performed on large ſtocks, and which muſt be twice cleft, and the clefts muſt not be acroſs, but parallel to each other, and ſo fix the grafts in the ſtock, obſerving to bind, and clay them as before. This kind of grafting may likewiſe be performed on the branches of trees that already bear fruit, if you deſire to change the ſorts.

THIRD. CROWN-GRAFTING.

This way of grafting is commonly practiſed upon ſuch ſtocks as are too large and ſtubborn to cleave, and is often perfomed upon the branches of apple and large pear trees, &c. that already bear fruit, when it is intended to change the ſorts, or to renew the tree with freſh bearing wood.

The

The manner of doing this ſort of grafting is as follows: firſt to cut off the head of the tree or ſtock level, or of any particular branch of a tree which you intend to graft, and pare the top perfectly ſmooth, then prepare your grafts, which is done by cutting one ſide flat and a little ſloping about two inches in length, making a kind of ſhoulder at the top of the cut, to reſt on the head of the ſtock; and pare off only a little of the bark towards each edge of the other ſide of the graft; then raiſe the bark of the ſtock, firſt by ſlitting it downwards, and then having a ſmall wedge of hard wood, or rather iron, one ſide of it formed ſomewhat roundiſh, the other flat; let this inſtrument be driven down gently between the bark and wood of the ſtock or branch, the flat ſide towards the wood, driving it far enough to make room for the graft; then drawing out the wedge, ſlip down the graft, placing the cut or ſloped ſide towards the wood, thruſting it down as far as cut, reſting the ſhoulder thereof upon the top of the ſtock; and in this manner you may put four, five, or ſix grafts, or as many as may ſeem convenient, upon each ſtock or branch, and bind them round with ſtrong baſs.

When

When the grafts are all thus fixed, you muſt then immediately apply a good quantity of well wrought clay; bringing it cloſe about the ſtalk and grafts, obſerving to raiſe it at leaſt an inch above the top of the ſtock, in a rounding manner, ſo as to throw the wet quickly off, and prevent its lodging or getting into the work, which would ruin all.

Theſe trees which are grafted this way, will take and ſhoot very free; but there is, for the firſt year or two after grafting, an inconvenience attending them, and that is the grafts being liable to be blown out of the ſtock by violent winds; but this may be remedied by tying two or three ſticks to the body of the ſtock, or branch, that is grafted, and the grafts tied to the ſticks.

FOURTH. GRAFTING *by* APPROACH, *Or*, IN-ARCHING.

Another way of grafting occaſionally practiſed, is generally called in-arching, or grafting by approach; but is not near ſo commonly, practiſed as the three ways beforementioned, and was chiefly invented for ſuch trees, as are

are not eaſily propagated by any other method.

The method of performing the operation is this: when it is intended to propagate any kind of trees or ſhrubs by this manner of grafting, it muſt be obſerved, that the ſtock you would graft upon, and the tree from which you would take the graft, muſt ſtand ſo near, or can be placed ſo near, that the body of the branch you would in-arch, can, as it grows, be brought to approach and join readily to a convenient part of the body of the ſtock; for the graft is not to be ſeparated from the mother plant, till ſome months after performing the operation; nor is the head of the ſtock to be cut off till that time, except you cannot otherwiſe conveniently fix the graft.

For inſtance, either having the ſtocks and the trees deſigned to in-arch from, growing on the ſame ground near together, or in pots, or that you want to in-arch ſome branches of trees,&c. and that the ſaid branches are three, four, or five feet or more from the ſurface of the ground, and ſuppoſe the ſtalks you would graft upon to be in pots; in that caſe there muſt be a kind of ſlight ſtage erected, cloſe to, and as high as the branches of the tree:

upon

upon this ſtage the pots which contain the ſtalks muſt be placed.

Thus far obſerved, then, in either caſe, proceed to the work, take one of the branches you deſire to in-arch, and bring the body of the ſaid branch to touch that of the ſtock at ſuch a convenient height, where the ſtock and graft is nearly of a ſize, and mark the parts where the graft and ſtock will moſt readily join together; then in that part of the branch pare away the bark and part of the wood, about three inches in length, and in the ſame manner let the rind and wood be pared off that ſide of the ſtock where the branch is to be joined, the ſame length and breadth, ſo that both the cut parts may exactly join rind to rind; then cut a ſlit or thin tongue upwards in the branch, and make a ſlit of the ſame length to receive it downwards in the ſtock; then let them be joined, placing the branch with the top upright, ſlipping the tongue of the graft into the ſlit made in the ſtock: and ſee that the cut parts join in an exact manner, and let them be immediately tied together with ſome baſs, and afterwards cover over the place with a due quantity of well wrought clay, very well cloſed, that no air nor wet can penetrate.

graft = injerto pimpollo to pare = recortar
rind = corteza cut = raja hendidura
bass = esparto.

After

After this, let a ſtout ſtake be driven into the ground, and that part of the ſtock and graft muſt be faſtened to it, which prevents the graft from being diſplaced by the wind. Remember that the ſtock and graft are to remain in that poſition for at leaſt fifteen or ſixteen weeks, when they will be well united. The graft is then to be ſeparated from the mother plant; being careful to do this with a perfect ſharp knife, cutting off the branch with a ſlope downwards to the ſtock; and if not done in grafting, the head of the ſtock to be cut cloſe to the graft. The old clay and bandage are at this time to be taken off: and at the ſame time it will be adviſeable to tie them again gently, and alſo to put ſome freſh clay which will be of great ſervice, and let them remain ſo for a month or five weeks.

By this kind of grafting, you may raiſe almoſt any kind of tree or ſhrub; as is often practiſed by way of curioſity, to ingraft a fruit bearing branch of a fruit-tree upon one of the common ſtocks of the reſpective ſorts; by which means, there is raiſed a new tree, bearing fruit in a few months: this is ſometimes practiſed upon orange-trees, &c. by grafting fruit branches on ſtocks raiſed to a proper ſize, from the kernels of the fruit.

shrub = arbusto. kernel = almendra

Note, in this method of grafting, the ſtocks may occaſionally be both in the full ground or in pots, the latter is neceſſary where the branches of the trees you would in-arch are not near enough the ground, or for orange and other green-houſe trees and ſhrubs; but as for ſuch trees and ſhrubs as grow in the common ground, and whoſe branches are favorably ſituated for that work, there may be ſtocks placed either in pots, or planted in the ground near the ſaid trees, &c. or it may be performed on ſtocks or trees that grow accidentally near.

BUDDING OR INOCULATING.

The proper time for budding or inoculating, is from the latter end of June to the beginning of Auguſt; firſt begin on ſtone fruit, the early kinds, ſuch as apricots, peaches, and nectarines; cloudy weather beſt ſuits this work; but if no ſuch weather happens, it will then be moſt proper to do it principally in a morning or evening.

The proper ſtocks on which to bud the above kinds of fruit-trees, are principally thoſe of the plumb, raiſed from the ſtones of the fruit; and when two or three years old, are

are of a proper ſize to bud upon; or theſe ſtocks may be alſo raiſed from the ſuckers of plumb-trees.

It will be of particular ſervice in this country to bud the peach on plumb-ſtocks, as it will make the peach trees laſting; for the worm that deſtroys the peach-tree raiſed from the ſtone of that fruit in a few years, will not hurt that raiſed on the plumb-ſtock. —The buds muſt be inſerted one in a ſtock at about ſix inches from the ground, if the tree is intended to be a dwarf; but for a large ſtandard, the budding may be performed at the height of three, four, five or ſix feet.

Cherries are to be budded principally upon cherry ſtocks, which muſt be alſo raiſed by ſowing the ſtones; and all ſorts of plumbs ſhould be budded on plumb ſtocks; pears may be budded on pear ſtocks; and theſe muſt be raiſed by ſowing the kernels. Oranges and lemons muſt be budded on ſtocks raiſed from the kernels of the ſame fruit. Roſes, jeſſamines, myrtles, and any other curious ſhrubs, may be inoculated; the curious ſorts budded on the common ones of the ſame ſpecies;

Buddin

Budding may alſo be performed upon trees that bear fruit. What is meant by this, is where there are trees, that produce fruit not of the approved kinds; ſuch trees may be budded with the ſorts deſired; and the budding is to be performed upon ſtrong ſhoots of the ſame ſummer's growth. Several buds may be put into every ſuch tree, by which means the tree will be ſoon covered with the deſired kinds, and in two or three years after budding they will begin to bear.

The manner of performing the work of budding or inoculating is this: in the firſt place, be provided with a ſharp pen-knife, with a flat ivory haft. The haft ſhould be ſomewhat taper, and quite thin at the end; which knife and haft is to be uſed as hereafter directed; and alſo provide ſome new baſs mat, for bandages; and let this, before you uſe it, be ſoaked in water. In the next place, you are to provide a parcel of cuttings of the reſpective trees from which you intend to take the buds: theſe cuttings muſt be ſhoots of the ſame ſummer's growth, and muſt be cut from trees as are in health, bear well, and ſhoot freely, minding to chooſe ſuch ſhoots as have ſtrength, and are free in their growth, but not luxuriant.

Having

Having your cuttings, knife, baſs, and every thing ready, then proceed in the following manner: With the above knife, make a croſs cut in the rind of the ſtock, minding to make the cut no deeper than the bark; then from the middle of the croſs cut let another be made downward, about two inches in length, ſo that the the two cuts together form a T, in which inſert the bud. Then get one of your cuttings, or ſhoots, and take off the bud in this manner: you are to begin toward the lower, or biggeſt end of the ſhoot; and in the firſt place, cut off all the leaves, but obſerving to leave part of the foot ſtalk of each remaining; then, about an inch below the lower bud or eye, make a croſs cut in the ſhoot, almoſt half way through, with the knive ſlanting upwards, and with a clean cut, bring it out about half an inch above the eye or bud, detaching the bud with part of the bark and wood thereto: then immediately let that part of the wood which was taken off with the bud, be ſeparated from the bark, in which is contained the bud; and this is readily done with your knife, placing the point of it between the bark and wood at one end, and ſo pull off the woody part, which will readily part from the bark; then quickly examine the inſide, to ſee if the eye of the bud be left; for if there appears a ſmall hole,

hole, the eye is gone with the wood, and is therefore uſeleſs : take another ; but if there be no hole, the bud is good, and is to be immediately inſerted in the ſtalk, obſerving for the reception of the bud, to raiſe gently, with the haft of your knife, the bark of the ſtalk on each ſide of the perpendicular ſlit, from the croſs cut above, and directly thruſt the bud gently in between the bark and the wood, placing it as ſmooth as poſſible, with the eye of the bud in the middle, obſerving, if the bud be too long for the inciſſion in the ſtalk, ſhorten it accordingly when inſerted, ſo as to make it ſlip in readily, and lie perfectly cloſe in every part.

Having thus fixed the bud, let the ſtalk in that part be immediately bound round with a ſtring of new baſs mat, beginning a little below the cut, and proceeding upwards, drawing it cloſely round to the top of the ſlit ; but be ſure to miſs the eye of the bud, bringing the tying cloſe to it below and above, only juſt leaving the eye of the bud open ; and this finiſhes the work for the preſent.

In three weeks, or a month after the inoculation is performed, the buds will have united with the ſtalk, which is diſcoverable by the bud appearing plump ; and thoſe that have not taken, will appear black and decayed ; therefore,

therefore let the bandages of thoſe that have taken, be looſened ; and this is done in order to give free courſe to the ſap, that the bud according as it ſwells, may not be pinched ; for were the bandages ſuffered to remain as firſt tied, they would pinch the buds and ſpoil them. To prevent this, it would be moſt adviſeable to looſen them all in about three weeks, or, at fartheſt, a month after budding, which concludes the work till the March following, as, until which time,the bud remains dormant, then ſhoots forth with vigor.

At the time, i. e. the beginning of March, you are to cut off the heads of the ſtocks; obſerving to cut them off about a hand's breadth above the inſertion of the bud ; and this part of the ſtock left above the bud is to remain till the next ſpring, and will ſerve to tie the ſhoot to, which the bud makes the firſt ſummer : for the buds never begin to ſhoot till the ſpring after budding. Or, in the ſpring, as aforeſaid, you may cut the head off at once near the bud, behind it in a ſlanting manner.

The fruit trees which were grafted and budded a year ago, ſhould have their ſhoots, which were produced the laſt ſummer, ſhortened, that they may ſend forth lateral ſhoots,

or

or branches, to form a regular head near the ſtock.

Examine the trees, which were budded the laſt ſummer, and let all ſhoots that ariſe from the ſtock, beſides the bud-ſhoot be diſplaced; for theſe would rob the proper ſhoot of ſome nouriſhment.

Having dwelt very fully on the proper methods of propagating all the ſorts of fruit trees as is neceſſary for the farmer, which by proper attention, every one, even of the meaneſt capacity, may plant nurſeries of young trees of their own, and bring them to that perfection fit for planting out in the field, which will ſave them that money; for the nurſery will be of no expence, and attended with very little trouble.

There are ſome very ignorant men, who raiſe thoſe trees which they ſell to the farmer. Theſe men make you believe there is ſome great art in propagating theſe ſpecies, when at the ſame time nothing can be more plain and eaſy. The plants for the ſtocks to graft on, may be picked up in your orchards, fields, or gardens, which if taken up at the proper ſeaſon (ſpring and fall) and planted at fifteen or eighteen inches apart in the rows, and five feet

feet between the rows, which will admit of its being plowed between to keep them clear from weeds. By this method there may be collected in a ſhort time, a ſufficient quantity of ſtocks, fit for grafting or budding. Obſerve when thoſe young plants are planted, let them be well watered.

I ſhall now proceed to ſhew the great advantages accruing to the farmer by planting fruit trees in the field: it furniſhes him with a good beverage for common uſe; and likewiſe if he chooſes to diſtil his cider, it will make a good wholeſome ſpirit; and what the farmer has to ſpare, will always fetch him ready money.

PROPER METHODS *of* PLANTING *and* MANAGING TREES *in the* FIELD.

The proper time for planting them out, is, from the beginning of October, till the beginning of May, in mild open weather; they ſhould not be planted too near or cloſe together, two pole or perch is the neareſt diſtance, but if they were planted three perch apart every way it would be much better, as they would

not be ſo apt to blight, neither would they hurt the grain or graſs that grow underneath.

I ſhall firſt give directions for planting thoſe fields that are under the plow; and ſecondly, thoſe fields that are under graſs, or has a ſward.

The method of planting fruit trees in the plowed fields is to open a wide hole for every tree about a ſpade deep, at the proper diſtances you intend planting of them, and looſen the bottom well; then prune the roots of the trees; that is, cut off bruiſed or broken roots, and trim the ends a little of all, the very long ſtraggling roots in general; and prune out irregular ſhoots of the head: then place the tree in the hole, put ſome good mould to the roots and cover them about four inches, then get ſome long dung that is moiſt, or wet ſtraw and fill up the hole with it, then throw ſome good mould over the dung or ſtraw, which raiſe in form of a hill, and make a trench round the tree at the diſtance of about eighteen inches from the ſtem of the tree, to receive, and retain the wet; which will ſave the trouble of watering in dry weather.

To ſupport the new planted fruit-trees from the violence of the winds, let ſtakes be drove down in thoſe trenches, and faſtened

atop

atop to the ſtem of the tree, with ſtraw bands, as they are ſoft and will hinder the tree from chafing.

The method of planting fruit trees in thoſe fields under graſs, or turf, ſhould be done in the following manner; pare as thin a turf off as poſſible, then take up all the mould even to the clay, gravel, or ſand; this done, put the turf at the bottom of the hole, the graſs downwards, ſpread a little good mould on the ſame, on which plant the tree as before directed: Then with a ſpade firſt give a circular cut about the baſon-heap of mould; then ſix or eight inches back from that, give another circular cut, and turn up all the turf, letting it lie with the graſs part downwards, ſlopeways, and joining the ſaid baſon-heap; by this, there will be a round gutter, which at all times is ready to receive and make a lodgement of all rains that ſhall fall, and will ſufficiently ſupply the fibrous roots with moiſture as they gradually proceed from the maſter-roots.

The dung or ſtraw being placed between the two moulds, becomes a watering pot to the root, and by the help of the uper mould, laid

laid in a baſon form, ſhelters and ſhades the ſame, both from the ſun and air's too violent influences.

There is another method which I have tried with ſucceſs; I had a field that was 40 poles or perches ſquare, all round this field next to the fence I planted with apple trees, at the diſtance of two perch aſunder, and twenty feet from the fence, ſo that I had eighty trees in one row, in the form of a ſquare. The middle of the field was plowed in general, and ſowed with grain, the border all round for forty feet was laid down with graſs, ſo that the trees ſtood in the middle of the graſs plat. Theſe trees bore abundantly; the cauſe of which I imagine was by their having a free circulation of the air; and I had great crops of grain in the middle of the field, from its not being ſhaded too much, and by the trees fending off the cold winds.

To make a COMPOSITION *for curing* INJURIES *and* DEFECTS *in* TREES.

Take one buſhel of freſh cow-dung, half a buſhel of lime rubbiſh of old buildings (that from the ceilings is preferable) half a buſhel of wood

of wood aſhes, and one gallon of pit or river ſand. The three laſt articles are to be ſifted fine before they are mixed; then work them well with a ſpade, and then with a wooden beater, until the ſtuff is very ſmooth, like fine plaiſter uſed for the ceilings of rooms.

The compoſition being thus made, care muſt be taken to prepare the tree properly for its application, by cutting away all the dead, decayed, and injured part, till you come to the freſh ſound wood, leaving the ſurface of the wood very ſmooth, and rounding off the edges of the bark, with a draw-knife, or other inſtrument perfectly ſmooth, which muſt be particularly attended to; then lay on the plaiſter about one eighth of an inch thick, all over the part where the wood or bark has been ſo cut away, finiſhing off the edges as thin as poſſible; then take a quantity of dry wood aſhes, mixed with a ſixth part of the aſhes of burnt bones, put it into a tin box with holes atop, and ſhake the powder on the ſurface of the plaiſter, till the whole is covered with it, and in half an hour ſhake on more, and rub it with your hand, and repeat it till the whole ſurface is dry and ſmooth.

All trees cut down near the ground, ſhould have the ſurface quite ſmooth and rounding

as

as before; and the powder as before ſhould be mixed with an equal quantity of powder of alibaſter, as the growth of the tree will gradually affect the plaiſter, by raiſing up its edges next to the bark, care muſt be taken where that happens, to rub it over with the finger, that the plaiſter may be kept whole to prevent the air and wet from penetrating into the wood. If any of the compoſition is left, it ſhould be put in a tub, and covered over with urine.

DIRECTIONS *for* BREWING *of* BEER.

I would wiſh to introduce the drinking of beer in this country, for the common drink; knowing by experience that it is the moſt wholeſome beveradge made uſe of; therefore recommend it to private families, to brew their own beer.

The high price beer is ſold at by the brewers, may deter ſome from undertaking it: thinking it may be very expenſive; but I ſhall here lay down the expence, which will ſatisfy them to the contrary.

If the farmers were to let their men have good beer, or ale, at hay and harveſt time, to drink

to drink inſtead of cider and ſpirits, they would be able to go through double the labour, with half the fatigue to themſelves. In order to prepare for the breewing of beer, the utenſils muſt firſt be procured, and fixed. For thoſe that can afford it, and would wiſh to have a handy and complete brewhouſe, I will give them a ſketch of one, with the proper utenſils on a plan fit for family uſe.

Firſt, the brew-houſe ſhould be erected on the northern ſide of your buildings, for ſhade and coolneſs; the ground plan ſhould be twenty feet, by fifteen feet; three ſides out of the four ſhould be open, eſpecially of the upper part, to let in the free circulation of air: theſe open ſides ſhould have brackets ſlanting downwards, to fix or nail battons on about three or four inches wide, to keep out the wet. The copper, which at leaſt ſhould hold forty gallons, ſhould be fixed at the cloſe end, with a chimney to go through the roof. This copper ſhould have a braſs cock, and the copper ſhould be ſet pretty high. The maſh ton ſhould hold double the quantity of the copper, in order to hold the malt, as well as the water; this ton ſhould be circular, and largeſt at the bottom, and ſhould be ſo placed that the water from the copper may run through a ſhute into the top of the maſh ton.

And

And underneath this maſh ton, there muſt be placed an underback, made in the ſame form of the maſh ton, but need not hold more than the copper, then there muſt be two coolers made ſquare and ſhallow, not above ſix inches deep, and placed one above the other; the top of the higheſt muſt not be higher than the top of the copper, and each of them muſt hold as much as the copper, and underneath, or near the coolers, muſt be fixed a working ton, of the ſame form of the maſh ton, and the ſame ſize; there ſhould be a falſe bottom to the maſh ton, and a cock fixt below the falſe bottom, to let the wort out into the underback; and in this underback ſhould be fixed a pump, to pump up the wort, back into the copper; then there is wanting a maſhing oar, pails, bowl, &c.

METHOD *of* BREWING BEER, *or* ALE, *from* MALT.

The proceſs of brewing is as follows: a quantity of water being boiled in your copper, is emptied into the maſh tub; and as ſoon as the vapour is ſpent, the malt is poured upon it; but it muſt not be ſtirred till the malt has ſettled gradually, and the liquor, on preſſing

preſſing it down with the hand, appears above it, then it muſt be ſtirred well and worked with the maſh oar, for a quarter of an hour, then cover it cloſe with bags, &c. which muſt continue undiſturbed for half an hour; then draw the wort off into the underback, and put your quantity of hops into it, which ſhould be put into a large net. As ſoon as your water boils again, empty it into the maſh tub, which is to be ſtirred and worked with the maſh oar for half an hour, and cover the top with freſh malt; then cover it up with bags. &c, as before, when it muſt ſtand for an hour and an half before it is let into the underback.

Obſerve, that as ſoon as the ſecond copper of boiling water is emptied into the maſh tub, then the firſt wort mixed with hops muſt be returned into the copper and boiled an hour for ſtrong beer, if to be drank new; an hour, and an half if to be kept ſome time; always taking care to make the wort boil reaſonably faſt; for if it ſimmers long, it will waſte more and ferment worſe.

This firſt wort or ſtrong beer when boiled enough is put into the upper cooler, and from that let into the lower one. If it is in the ſummer, it muſt be drawn off very cool into the working ton, but if it is in the winter,

it muſt be blood warm when you ſet it to work. The ſecond wort is for table beer and common drink, which is let into the under-back, from that to the copper, &c. the ſame as the ſtrong beer; the ſame hops, with only a few freſh ones will do for it.

When the wort is cool enough for the fat, a little yeaſt is mixed with a ſufficient quantity of warm wort to make it ferment in the hand bowl, and this fermentation is put into the working tub, and when it has raiſed a thick yeaſt or ſcum upon the wort in the fat, it ſhould be mixed again with the hand-bowl. When it is ſufficiently fermented in the fat, it muſt be put into your casks or barrels, and there ſuffered to ferment a few days longer. After which the veſſels muſt be ſtopped cloſe, and not opened till fit to drink.

Soft water is the beſt for brewing: rain water exceeds all others; therefore, if it could be ſo contrived to have a back, what the brewers call a liquor back, on the top of the brew-houſe, and the rain water conveyed to it by gutters from all parts of your houſe, you might ſave a ſufficient ſtock; which might be let into the copper by a pipe with a cock at the end, which would ſave a great deal of labour.

The

The beer may be brewed to what ſtrength you pleaſe. I have uſed ſix buſhels of malt to make one barrel of ſtrong beer, and one barrel of middling; but the ſtrong beer, when I have kept it till it was two or three years old, has been almoſt as ſtrong as brandy. I have found that three buſhels of good malt has made me one barrel of ſtrong beer, and one barrel of common, and was very good.

The quantity of hops to be uſed is according to their quality, and the time you would wiſh to keep it. If the hops are good, and the beer is intended to be drank new, two pounds will do for two barrels. If you would wiſh it to keep any time, you muſt uſe four pounds; and if to be kept till it is old, ſix pounds of hops to the two barrels of beer, will not be too much.

There are many who cannot afford to build a brew-houſe, or to buy the utenſils as beforementioned; therefore I will endeavour to put them in a method to do it at a ſmall expence. A back kitchen or any outhouſe, where a ſmall copper can be put up, will ſerve inſtead of a brew-houſe; for if the copper is ſmall, it is only boiling it the oftner. Rum hogſheads may often be bought at the

ſtores

ſtores for five ſhillings or a dollar a piece: four of thoſe hogſheads properly cut, will ſerve for all the utenſils, for maſh tub, underback, coolers and working tub; then two buſhels of malt, and two pounds of hops, will make two barrels of good beer, if the firſt and ſecond worts are mixed together.

To make CIDER *keep, and be much ſtronger than common.*

It is of great importance in making cider to have the fruit thoroughly ripe. The juices of unripe fruit, retain their harſh, ſour ſtate in ſpite of all endeavours, and never acquire that racy, mellow flavour, which the ſun only can beſtow. It ſhould therefore be the firſt care of every one concerned in making cider, to let his apples hang on the trees, till they arrive at their full maturity.

When your apples are fit for gathering (which ſhould always be done by hand) it is eſſential to chooſe dry weather for that purpoſe; for water is a bad ingredient in all vinous liquors: one general rule for all fruits is to preſs their juice for fermenting, when the

the fruit is in the greateſt perfection for eating.

Apples that have lain any time in heaps to ſweat, are generally covered with a clammy moiſture; this ſhould be wiped off, for it is a watry juice, which would impoveriſh the cider; the rotten parts of the apples ſhould all be cut out, for they communicate to the cider a putrid taſte.

In breaking of the apples, that engine is beſt, which leaſt bruiſes the ſkin, pulp, and kernels of the apple; becauſe from an immoderate breaking of them in ſome kinds of apples, there proceeds ſuch an auſterity and bitterneſs, as the cider never can be cured of. In preſſing of them, they ſhould not be preſſed too near, and the pulp ſhould be wrapped up in clean hair cloths, inſtead of the common cuſtom of this country, incloſing it with bands of ſtraw, which ſtraw, when it has heated in the mow or ſtack, gives the cider a bad flavour. And in order to avoid a great deal of trouble, and to perform the work more effectually, by diveſting the new made cider of what pummice and other impurities which remain; after ſtraining it through a hair ſieve, on its coming from the preſs, it is neceſſary

neceſſary to be provided with a large open vat, which will contain a whole making, or as much as can be preſſed in one day. After the cider has remained in this vat a day, or ſome times leſs, according to the ripeneſs of the fruit, of which it has been made, and the ſtate of the weather, you will find riſe to the top, the pummice or groſſer parts of the pulp, &c. of the apples; and in a day or two more, at moſt, grow very thick; and when little white bubbles or fermentations of the bigneſs of the top of your finger, break through it, then preſently draw it off through a cock or faucet hole, within three inches of the bottom, that the lees may not be drawn off, but quietly remain behind.

If the cider is not immediately drawn off, on the firſt appearance of theſe white fermentations, all the head, which is then become a thick cruſt, will ſink to the bottom; ſo that, if this criſis, which happens but once of the firſt ſeparation of the cider from its lees is neglected, the opportunity of making ſweet cider will be loſt and irrecoverable.

On drawing off the cider from the vat, it muſt be tunned into cloſe caſks well ſcented, and a match burnt in them before the cider is put in.

To

To have cider perfectly ſweet, after it is tunned into cloſe casks, you are again carefully to watch and obſerve its ſtate, and when you find white bubbles or fermentations as aforeſaid, at the bung-hole, immediately rack it off again into another clean and well ſcented caſk; after which moſt probable, it will be March before it ferments again, when it muſt be racked off as before: and to hinder its fermenting again, put a handful in each barrel, of powdered loam or clay, and to ſtrengthen and make it keep, put a quart of apple brandy into each barrel; and every caſk muſt be filled up to the bung, and cloſely bunged down.

To make CIDER STRONGER *than the common method.*

Take a cask of cider, or more, managed as before directed, and make a ſtand for it in your garden, or any other place where it will be expoſed to the weather: before the froſt ſets in, let the cider be ſet on the ſtand, but not filled full by two or three gallons, and when you find that all the aquæ parts are frozen, draw off the oily and ſpirituous part, and bottle it, putting two or three raiſin in each

each bottle, and you will find it excellent ſtrong cider; and you will not looſe above one third of your cider: Indeed it cannot be properly called ſo, as it is only the watry part of the cider that is loſt.

A DESCRIPTION OF A DRILL MACHINE.

The uſe of this machine is for planting all ſorts of grain, graſſes, turnips, &c. in equidiſtant rows.

It conſiſts of a box in which the cilinders and hoppers are confined to keep the grain, &c. dry, and that the wind ſhould not affect the delivery, an axle-tree goes through this box which is ſquare, and the cilinders are fixed on it, which is ſo contrived to ſlide off and on: for there is two ſets of cilinders, one ſet for the large ſorts of grain, ſuch as indian-corn, peas, beans, &c. the other ſet for wheat, barley, oats, &c.

This axle-tree is worked by a pair of wheels, four feet in diameter, which ſupports the box; and as the cilinders have holes cut in them to receive the grain from the

the hoppers, the wheels turning round as it is drawn by the horſes, it drops from theſe holes, into tin funnels, that are placed underneath, that goes to the back part of the iron coulters, which are hollow behind; thoſe coulters open a furrow to receive the grain which falls through the tin funnels, whereby it is depoſited regularly.

Theſe coulters are put into a frame, which is faſtened by two bolts and ſcrews that go through holes that are in the top of the coulters: ſo that theſe coulters may be removed to any diſtance apart, from ſix inches, to four feet. When at ſix inches, there are ſix coulters fixed in the frame; then it ſows ſix rows at a time; if at twelve inches, four coulters, and if at its utmoſt weadth only two coulters.

The two wheels that work the machine are ſet at four feet, ſix inches apart, and there are ſharp iron ſpikes, fixed round the rim to keep it from ſlipping. By this pair of wheels, and a ſmall one before fixed in the frame two feet diameter, this machine is worked. This ſmall wheel's gudgeons goes into holes in ears, which are faſtened to the frame; theſe ears have four holes in them an inch diſtant from

from each other; which raiſes and lowers the frame, whereby the grain is depoſited, from one inch to four inches deep into the ground. This frame has two handles behind to turn the machine round at the land's end, ſo that if the two wheels were taken from it, it would have the appearance of a long wheel barrow with a high box fixed on it. There is a flap at the top of the box, for the purpoſe of opening to put the ſeed into the hoppers: and another flap before it, that is for the convenience of opening to get at the works: there is a ſmall harrow fixed with chains at the back part of the frame, that follows the coulters and covers the ſeed. The two ſets of cilinders as mentioned before, conſiſt of four and ſix; the four is for the large ſeed, which never require the ſeed to be ſet nearer than twelve inches between the rows; the ſix are for ſmall grain or ſeed, and may be ſet as near as ſix inches or at nine, twelve, &c. There are alſo two ſets of hoppers made to fit each ſet of cilinders, and at the back of thoſe hoppers there are regulators with bruſhes, that ſlide down on the cilinders, which are fixed to any height by ſcrews, which lets the ſeed through ſlow or faſt, according as they are fixed, by which means may be ſown from half a buſhel to three buſhel of grain to an acre.

The

The coulters are fixed on two bars in a triangular manner, which when ſet at ſix inches, makes it twelve, which admits of ſtones, clods, and weeds, to go through, which hinders them from clogging. Before the fore wheel, there is a bar fixed in the frame with a hole in the centre, this is for a pin to go through to fix a whipple tree, for two horſes to go a breaſt: likewiſe iron rings at each end for chains, for one horſe to draw it, or for two, one going before the other.

DESCRIPTION *of a* RUNNING HOE.

This hoe is for cutting weeds between the drilled grain, and adding earth up to the vegetables; if the ground is mellow, and free from ſtones, a man will hoe a great deal with it in a day. The conſtruction of it is ſome thing like a breaſt plow, to ſhove on forward. The two corners are points, which extend out about four inches more than the middle, it goes in a circular manner from the corners to the middle, ſo that it forms a half circle; at the other end of the hoe is a ſocket for putting in a wooden handle; in this part of the hoe, the ſocket riſes gradually up, in order to raiſe the handle to go againſt the thighs, or breaſt, for ſhoveing it along; and at that

part

part of the plate of the hoe, next the handle or ſocket, is fixed a plate of iron, riſing high in the middle, and goes off to nothing at the ſides, in the form of a half moon; this throws up the mould on each ſide, and moulds up the grain, &c.

The edge being in a circular manner, collects the weeds and are in a manner encloſed, and are more effectually deſtroyed than when the blades is ſquare or angular, and it works much eaſier.

The handle ſhould be three feet ſix inches long, with the ſocket ſix inches, makes it four feet; the end of the handle next the hoe ſhould bend downwards to raiſe the other end to its proper heigth; at the other end of the handle muſt be a croſs piece, and in the middle of this croſs piece muſt be fixed a pad ſtuffed, about one foot long, and at each end muſt be ſix inches left to lay hold of with the hands, which will make this croſs piece two feet long.

This hoe may be made of any breadth, according to the weadth of the alleys between the grain, &c. if the rows are at ſix inches apart, the hoe muſt not be above four inches; if at nine inches, the hoe muſt be

ſix

ſix, and if twelve inches, eight, and ſo in proportion.

FOR MAKING *and* PLAISHING *of* HEDGES.

This manner of fencing will be found a cheap and excellent method, and if properly made will excel a poſt and rail fence, for no ſort of cattle can go through it, neither will they attempt to leap over it. On many plantations they have not wood enough to make poſts and rails for fencing, therefore are at a great expence in purchaſing of them. There are very few plantations but has ſufficent for hedging; and thoſe that have not, may in a little time raiſe enough, by ſowing acorns, the haw, or beech, or planting of alder, willow, poplar, &c. where the hedge, or hedge row is intended; for the largeſt wood that is required, need not be above four or five inches in circumference.

The method of making this hedge or fence is as follows: firſt dig a trench or ditch, three feet wide at top, which ſhould be dug down in a ſloping manner, till it comes to two feet at

at bottom, and the ditch ſhould be two feet deep, where the ground will admit of its being dug ſo deep. There ſhould be three or four layers of turf laid upon one another on the top of the edge of the trench, on that ſide you intend to make the hedge, and the mould that is dug out of the ditch ſhould be thrown up on the turf, to make a bank for the hedge; the turf that is placed on the edge grows, and the roots of the turf extend themſelves into the bank, which prevents the froſt in the winter from making it ſcarf in.

On the top of this bank, nine or ten inches from the edge, the hedge is made; firſt cut the ſtakes five feet long, of any ſort of wood, from two inches and a half, to five inches in circumference. If the ſtakes exceed five feet in length that will not ſignify, as the tops may be cut off to their proper length after the hedge is finiſhed. The bottom of thoſe ſtakes ſhould be cut ſharp in a three ſquare manner. They ſhould then be drove in the bank with a maul about eighteen inches deep and not to exceed two feet apart between them; if they are put in a ſtraight line, they will look the better.

Then cut the eithers, which ſhould be out of your longeſt and ſtraiteſt poles, and pretty ſtout,

ſtout, but not ſo ſtout as the ſtakes; theſe eithers are for putting on the top in a wicker manner, to keep the bruſh in tight that is put between the ſtakes.

In cutting out theſe ſtakes, and eithers, you will cut a good deal of bruſh, which will all do for filling up; you muſt cut ſome more ſmall bruſh, to have a ſufficient quantity. This bruſh ſhould be twined in between the ſtakes in a wicker manner as well as the eithers, that is before one ſtake, and behind the next, and ſo on, and it ſhould be preſſed down tight. All the live wood that is growing near the hedge, and can be lain down and trained to it, ſhould be cut about half off, and laid down in the hedge among the bruſh in a wicker manner as before directed; and if there is any vines, twine them in the ſame manner: all thoſe will make freſh ſhoots, and grow up in the hedge, and ſtrengthen and make it more laſting.

This hedge will laſt ſix years, and by that time your wood where you cut, will be grown up again, and will ſerve to make a new fence. The ditch on the ſide of the fence, may be made to ſerve two purpoſes; for where the land is wet, and wants draining, it will ſerve for that purpoſe, and carry off the water.

How to manage and fatten Cows, Oxen, Sheep, Hogs, Calves, and Lambs.

Firſt cows, and oxen. Cows very much vary, not only in their make and ſhape, but alſo in their bags or udders, which the buyer ſhould have a particular regard to: ſome have their leathers thick and fleſhy, others thin and lainge. The thick leathered one will often ſeem big, and give but little milk, and that very hard to be got, when, a thinner one ſhall give much more, and be eaſily milked; therefore when a perſon is maſter of a right cow, it concerns him to keep her on; cows if well kept, will pay on an average about ſix pounds a year. In the winter, when you cant get graſs for your cows, give them turnips, potatoes, grains, or malt duſt; all of which are great breeders of milk; the malt duſt muſt be prepared as follows: to one cow put two quarts in a tub, pouring boiling water on it, and ſo three times a day.

A cow in a middling caſe, that is fed with ſtraw in the winter, need not have hay above a month before ſhe calves, for that ſhe will give more milk than if ſhe had it longer; be-

cauſe

cauſe the fatter the cow, the leſs the milk; and yet, if too poor, it is dangerous, leaſt ſhe falls in calving; a heifer will ſpring about three months before ſhe calves, but a ſeven years old cow only three weeks; as ſoon as ſhe has calved, throw a handful of ſalt on each ſide of the calf, which the cow will ſwallow, by licking of it; this will cauſe her to glean ſpeedily.

When a cow is bulled, as ſoon as it can be done, when ſhe comes home, throw a pail of cold water on her udder behind, and keep her up from any other that night, becauſe ſhe will be apt to ride them, and ſo miſs her bulling.

If you would fat a cow that has calved in the ſpring-time, dry her the beginning of Auguſt, and then ſhe will get fat with the after-paſture. Bullocks turned in to the paſture at the ſame time may be fatted. Cows and bullocks may be fatted in the winter in ſtalls with turnips and oil cake; they ſhould be both chopped ſmall. Let them have as many turnips as they will eat, and two quarts of the oil cake twice a day; they ſhould have a little good hay now and then to brouze on.

Sheep, are a cattle that are kept at the leaſt expence of any to the farmer, and will thrive upon almoſt any ground, and for this reaſon they ought to be prefered before the larger cattle. The beſt ſort of ſheep for fine wool are thoſe bred on high dry ground. The marſhes or low lands breed larger ſheep, but their wool is not ſo good.

The farmer ſhould always buy his ſheep from a worſe land than his own; they ſhould be big boned, and have a long greaſy wool, curling cloſe and well. Thoſe ſheep always breed the fineſt wool, and are alſo the moſt approved of by the butcher, or ſale in the market.

For the choice of ſheep to breed, the ram muſt be young, and his ſkin of the ſame colour with his wool, for the lambs will be of the ſame colour with his ſkin. He ſhould have a large long body, a broad forehead, round and well riſing, large eyes and ſtraight and ſhort norſtrils.

The polled ſheep, that is thoſe that have no horns are found to be the beſt breeders. The ewe ſhould have a broad back, a large bending neck, ſmall, but ſhort, clean and nimble legs, and a thick deep wool covering her all

all over. To know whether they be ſound or not examine the wool, that none of it be wanting, and ſee that the gums be red, the teeth white and even, and the briſket ſkin red, the wool firm, the breath ſweet, and the feet not hot. Two years old is the beſt time for beginning to breed, and the firſt lambs ſhould not be kept too long to weaken them by ſuckling; but be ſold as ſoon as conveniently may be. They will breed advantageouſly till they are ſeven years old.

To know the age of a ſheep, look in his mouth the ſame as in a horſe's; when he is one ſhear, he has two broad teeth before; when it is two ſhear it will have four; when three, ſix; when four, eight; after this their mouth begins to break.

As to the time of putting the rams to the ewes, the farmer muſt conſider at what time of the ſpring his graſs will be fit to maintain them and their lambs, and whether he has turnips to do it till the graſs comes; for very often both the ewes and lambs are deſtroyed by the want of food. Many thouſands of lambs and many ewes are loſt ſome winters in this country from the ſame cauſe. If the lambs are only ſtunted in their growth by it, it is an accident that they never recover. Numbers

bers in my travels laſt winter and ſpring complained to me of their loſing their lambs daily. They ſaid the ewe would not take to the lamb, or let it ſuck, and that they never knew any thing like it. The reaſon was obvious to me; the ewe was ſtarved, therefore had no milk for her lamb, which was the reaſon of her running from it, and taking no notice of her young.

The ewe goes twenty weeks with lamb, and according to this it is eaſy to calculate the proper time you would have them to yean in.

Ewes that are big ſhould be kept but bare, for it is very dangerous to them to be fat at the time of their bringing forth their young. They ſhould be well fed indeed, like cows, a fortnight before hand, to put them in heart.

The method of fattening ſheep and lambs on turnips you will find by turning back to the account given of the turnip and penning of ſheep. I have only to add that there ſhould be racks and mangers placed in the field that may be eaſily moved; in the racks there ſhould be ſome good upland hay, and in the manger

ger ſome grain. The tare or vetch is the beſt.

There is another method of fattening lambs, which is done in the houſe, therefore it is called houſe lamb; it is more delicate than that fatted in the field; which makes it fetch a greater price. This is done by ſuckling; the ewes are brought into the houſe to them twice a day, perhaps two or three for each lamb, that they may have their bellies full: they are faſtened by their head, that they cannot run from the lambs.

Sheep, as well as bullocks and cows, ſhould frequently have ſalt given them, which purifies the blood and keeps them in health.

Hogs are one of the moſt increaſing and profitable ſpecies of animals that can be kept on a farm, therefore deſerve the huſbandman's particular attention. From experience I have found that ſwine prefer ſaintfoin and lucerne, to clover; thoſe graſſes will fatten them with a ſmall quantity of corn, peas, or beans. Potatoes boiled in an iron pan, mixed with a ſmall quantity of Indian, pea, or bean meal, is a good fatner for them. Peas makes the meat of ſwine ſweeter and firmer

than

than any other diet whatever. Pumpkins with a ſmall quantity of corn or grain, will likewiſe fatten them.

When they are fattening in pens, it is neceſſary twice or thrice a week to add about three table ſpoons full of ſalt, to half a buſhel pail full of food, which aſſiſts digeſtion, conſolidates their food, and increaſes their appetites. About once a week, I have mixed two ſpoons full of madder, which prevents obſtructions, and on ſome other day in the week I give an equal quantity of flowers of ſalt petre and ſulphur well pounded and mixed; which purifies and cools the blood; which entirely prevents the meazles, keeps the ſwine extremely healthy, and fattens them more expeditiouſly.

Calves may be made very fat by the following method: The firſt week they ſhould not have their fill; but afterwards as much as they will ſuck; at three weeks or a month they ſhould ſuck two cows; when they are five or ſix weeks old, they ſhould have three cows to ſuck.

The calf ſhould be kept in a cloſe pen, ſheltered at much as poſſible from the cold and the light, and have ſome clean wheat-

en

en ſtraw every day to lay down on, ſhould have ſome powdered chalk, with ſome wheaten flour in a trough, and ſome large pieces of chalk hung up for the calves to lick at pleaſure, in order to whiten their fleſh, make them ſuck, and keep them from being laxative; and if then they ſhould ſcour, (which hinders their fattening) give them four ounces of bole armonic, powdered and mixed with milk, through a horn.

Give them now and then ſome black pepper mixed with urine, to cauſe a drought, that they may ſuck the more, and with bleeding them often, helps to fatten them the ſooner. Bleed them when a month old; at ſix weeks do the ſame again; and ſo every week after you keep them, it whitens their fleſh, and makes them fatter with leſs milk. I have had calves by theſe means at ſeven weeks old has weighed better than three hundred weight; which I have ſold to the butcher for 7l. 15s. ſterling.

There are two ways of breeding calves that are intended to be reared: the one is to let the calf run with its dam all the year round: this is the method in the cheap breeding countries, and is generally allowed to make the beſt cattle.

The

The other way is to take them from the dam after they have ſucked about a fortnight, they are then to be taught to drink fleet milk which is to be made but juſt warm for them, it being very dangerous to give it them too hot.

The beſt time for weaning of calves is from January to May; they ſhould have milk for twelve weeks after, and a fortnight before that is left off, water ſhould be mixed with the milk in larger and larger quantities. When the calf has fed on milk about a month, little whiſps of hay ſhould be placed all about him in cleft ſticks to induce him to eat.

The latter end of April or beginning of May, they ſhould be turned out to graſs only for a few days; they ſhould be taken in for the night, and have milk and water given them; the ſame may be alſo given them in a pail ſometimes in the field, till they are able to feed themſelves, that they do not regard it. The graſs they are turned into muſt not be too rank, but ſhort and ſweet, that they may like it and yet get it with ſome labour.

Calves ſhould be always weaned at graſs, for if it be done with hay and water, they often

often grow big bellied on it, and are apt to rot. When thoſe among the males are ſelected which are to be kept as bulls, the reſt ſhould be gelded for oxen: the ſooner the better, twenty days old is a very good time.

BREEDING *and* FATTENING HORSES.

A horſe is a moſt noble and uſeful animal; and in order to have a good and beautiful race, it is neceſſary to chooſe for a ſtallion a fine barb, free from hereditary infirmities; ſuch as weak eyes, bad feet, ſpavins, purſineſs and the like. Diſorders that ariſe from accidents are of no conſequence, nor is the horſe to be at all the leſs valued for them as a ſtallion.

Three months before this horſe is to cover a mare, he ſhould be fed with ſound oats, peas or beans, or with coarſe bread, and a little hay, but a good quantity of wheat-ſtraw; he ſhould be led out twice a day to water all this time, and after every watering walked about an hour, but not over heated. If he be not prepared and put in heart in this manner, the colts will be weakly, and the

horſe himſelf will be ſpoiled, growing purſy and broken winded.

If he is put to too many mares, he will not laſt long ; his mane and tail will begin to fall off through weekneſs, and it will be difficult to get up his fleſh again by the next year. The number of mares ſhould be proportioned to his ſtrength; and twelve, fifteen, or at moſt twenty,are as many as a horſe will well ſerve for in a ſeaſon.

Mares go with foal eleven months and as many days over as they are years old. This being certainly known, it is eaſy to contrive ſo that all your foals may be brought forth at a time, when there is plenty of graſs.

About the end of May the mares are to be put into an incloſure capable of feeding them, as long as the ſtallion is to be with them, or that they are in ſeaſon. In this incloſure all the mares are to be put together, as well thoſe which are barren as others.

The ſtallion's hind ſhoes are to be taken off, but the fore ſhoes ſhould be left on to preſerve his feet ; then lead him forth and let him cover a mare twice in hand, to render him more tame and gentle : after this, take

off

off the bridle, and turn him looſe among the reſt, where he will become familiar with them, and not one of them will be horſed, but when they are in ſeaſon.

There ſhould be a little lodge built up in ſome part of the incloſure, and corn, peas, beans, oats, bread, and other good food put into the manger in it, that the horſe may retire into it in the ſcorching heats, and eat what he likes beſt. He muſt thus be entertained during the whole time he is with the mares, which is to be about ſix or ſeven weeks.

Mares that are very fat and groſs do not hold well; but thoſe which are moderately fat, conceive with the greateſt ſucceſs and eaſe.

To bring a mare in ſeaſon, give her two quarts of hemp-ſeed night and morning for a week before ſhe is brought to the horſe. If ſhe refuſes it alone, it may be mixed with oats, corn, beans, &c. and if the ſtallion eat of it alſo, it will make him the better.

The ſtallion ſhould not cover before he is ſix years old, nor after he is fifteen. A mare ſhould never be covered before ſhe is three years

years old : they ſhould be always ſound and healthful, and of a good breed: ſuch as theſe will bring forth better and finer foals than any others.

The colts produced from theſe ſhould not be uſed as ſtallions, for they will degenerate, and the race will ſoon become exactly the ſame as this country breed. If a barb is not to be had, an Engliſh or Spaniſh Horſe is to be choſen.

The firſt backing of a horſe is a thing of great conſequence, as his value afterwards very much depends on it. After a colt has been exerciſed ſome time morning and evening, and becomes ſomewhat obedient, he is to be taken to ſome plowed lands, the lighter the better ; he muſt be made to trot over theſe in the hand, by that means to tire him and abate his wantonneſs. When this is done, care muſt be taken that all the tackling be good and firm, and every thing in its due and proper place ; then a perſon is to hold his head, and another to mount him, but this muſt not be done ſuddenly, or at a jerk, but very gradually and ſlowly, by ſeveral half-riſings and heavings. If he bears this patiently, the perſon is to ſeat himſelf firmly on his back ; but, if he be troubleſome and

not

not tamed enough, the perſon is to forbear the attempt to mount, and he is to be trotted hard in the hand over the ſame plowed lands again, till he is willing to receive the rider quietly on his back. When this is done, the perſon who is on his back muſt cheriſh him, and the man who has his head muſt lead him a few paces forward; then he is to be cheriſhed again.

The feet are to be fitted well in the ſtirrups and the toes turned out; afterwards the rider is to ſhrink and move himſelf in the ſaddle, and the perſon who holds his head is to withdraw his hand a little further from the mouth.

As the rider moves his toes forward, the holder muſt move him forward with the rein, till he is made to apprehend the rider's motion of body and foot, which muſt always go together, and with ſpirit, and will go forward without the other's aſſiſtance, and ſtay upon the reſtraint of the rider's hands. When this is accompliſhed let him be cheriſhed and have graſs and bread to eat; and then let the rider mount and alight ſeveral times, cheriſhing him between each time; and thus he is to be managed till he will go on or ſtand ſtill, at pleaſure. This being done, the long rein

may

may be laid aſide, and the band about his neck, which are always uſed on this occaſion, and nothing will be neceſſary but the trenches and caveſon, with the martingale. A groom muſt lead the way before; or another horſe, going only ſtraight forwards, and making him ſtand ſtill when deſired. In this manner, by ſometimes following and ſometimes going before another horſe on the trot, the creature will by degrees be brought to know that it is his buſineſs to be quiet and governable.

FATTENING OF HORSES.

The being able to do this ſpeedily requires ſome art, and indeed is one of the greateſt niceties of the whole management of that creature.

There is many methods; but the following may be moſt depended on: Take elecampane, cimmon ſeed, tamariſk, and aniſeed, of each two ounces, common groundſel one handful. Boil all theſe very well, with two hands full of garlic ſcraped and cleaned, in a gallon of good beer; ſtrain the liquor well off, and give the horſe a quart of it every morning made hot;

keep

keep him warm after it. After he has taken this for four or five mornings, he may be turned out to graſs, or kept in the houſe as the ſeaſon will permit; but whenever provender is given him, a quantity of a powder is to be prepared of equal parts of cummin ſeeds and elecampane, and give him half an ounce of it every time, ſprinkling it in by degrees, as he eats, that he may not nauſeate the whole.

If this method does not ſucceed in a ſhort time, then take two ſpoons full of diapente; brew it in a pint of ſweet wine, and give it the horſe for three mornings. This will take off any inward ſickneſs, and make the other things take effect. After this, feed him with good provender three times a day: that is, after his watering in the morning, after his watering in the evening, and at nine o'clock at night. If he does not eat the provender well and freely, it muſt be changed for ſome other kind.

If all this does not ſucceed, let the horſe be blooded; and then take half a buſhel of coarſe barley meal, put it into a pail full of water, and ſtir the whole together very well, then let it ſettle by ſtanding. Pour off the clear liquor into another veſſel, and let him drink it for his common drink, and eat the remainder

remainder which falls to the bottom of the pail.

If he refuſe to eat this alone, there may be ſome bran mixed among it. This ſhould be given him three times a day, morning, noon, and night. If he does not rightly take to the meal with the bran, ſome oats muſt be mixed with it, and this will readily bring him to feed on it; but which ever way is uſed, they muſt be by degrees diminiſhed in quantity, till at length he is brought to eat the meal alone; for that is the thing that muſt fatten him up.

Care muſt be taken that the barley be freſh ground, for it quickly grows ſour; and when this has once been the caſe with one parcel, no art will ever bring the horſe to touch it afterwards. Scarce any horſe but will be fattened by keeping him to this diet about twenty days. Barley cools and purges the creature; but the greateſt efficacy, as to the fattening him, lies in the water, which by this management takes up all the rich part of the barley into itſelf.

When the horſe grows luſty on this diet, it muſt be taken from him by degrees; giving

ing him at firſt oats at once, and barley meal twice a day; and then oats twice, and the barley meal once, till he is perfectly weaned from it. In the mean time he muſt have good hay, and he muſt not be rid, only it will be proper to walk him gently about an hour or two in the heat of the day.

If it be found that the horſe wants a good ſmart purging during the time of his continuing on the barley diet, the beſt time to give it him is after the firſt eight days, and the following is a very proper ſort of phyſic: take of the fineſt aloes one ounce, agaric in powder half an ounce, and powder of florentine orris one ounce. Let all theſe be mixed together, and put into a quart of milk warm from the cow. This will work very briſkly, and after it is over, the uſual diet is to be continued. Give him a pint of linſeed, or half a pint of linſeed oil mixed with his feed now and then, which will keep him clear from the botts, as well as the more ſpeedily fatten him.

How to know the AGE *of a* HORSE.

This is known from his teeth, hoof, coat, tail, and ears. The firſt year he has only

ſmall grinders and gatherers, of a brightiſh colour, which are called foal's teeth. The ſecond year he changes his four foremoſt teeth, viz. two above, and two below, and they appear browner and bigger than the reſt. The third year he changes the teeth next theſe, leaving no apparent foal's teeth before, but two above and two below on each ſide, which are all bright and ſmall. The fourth year he changes the teeth next theſe, and leaves no more foal's teeth before, but one above and one below on each ſide. The fifth year his foremoſt teeth are all changed, and the tuſhes on each ſide are complete; and thoſe which ſucceed the laſt foal's teeth are hollow, with a ſmall black ſpeck in the middle, which is called the mark in a horſe's mouth, and continues till he is eight years old. The ſixth year there appears new tuſhes, near which is viſible ſome young fleſh, at the bottom of the tuſh; the tuſhes being white, ſmall, ſhort and ſharp. The ſeventh year his teeth are at their full growth, and the mark in his mouth appears very plain. At eight, all his teeth are full, plain, and ſmooth, and the black mark but juſt diſcernable; the tuſhes looking more yellow than ordinary. The ninth, his foremoſt teeth ſhew longer, broader, yellower, and fouler than before, the mark quite diſappearing,

pearing, and the tuſhes bluntiſh. At ten, no holes are felt on the inſide of the upper tuſhes, which till then are eaſily felt. At eleven, his teeth are very long, yellow, black, and foul, and ſtand directly oppoſite each other. At twelve, the teeth of his upper jaw hang over thoſe of his under. At thirteen, his tuſhes are worn almoſt cloſe to his chaps if he has been much ridden; otherwiſe they will be long, black and foul.

With regard to the hoof: if it be ſmooth, moiſt, hollow, and well ſounding, it is a ſign of youth; but if, on the contrary, it be rugged and as it were covered with ſeams one above another, and withal, dry, foul and cruſty, it is a ſign of old age. If a joint about the ſtern of the tail, near the buttock be felt to ſtick out more than the reſt by the bigneſs of a nut, you may conclude him under ten, but if the joints are all ſmooth, he may be fifteen. If the eyes are round, full, and, as it were ſtarting from his head, having no pits over them, but ſmooth and even with his temples, and free from wrinkles, both under and above, it is a certain mark of his youth.

If the ſkin be taken up in any part between the finger and thumb; and being

let

let go, returns ſuddenly to its place, and remains without wrinkles, he may be judged to be young. You may alſo judge of a horſe's age by looking on his palate; for if he is old, the roof of his mouth is lean and dry towards the middle, and thoſe ridges which in young horſes are pretty high and plump, diminiſh as they increaſe in age; ſo that in very old horſes, the roof of the mouth is nothing but ſkin and bone. This laſt is a very neceſſary remark eſpecially in mares, which ſeldom have any tuſhes to diſcover their age by.

DISEASES HORSES *are ſubject to, with the* METHOD *of* CURE.

As this noble animal is ſubject to many diſorders, it is neceſſary every owner ſhould know how to treat them; therefore I ſhall give a ſhort treatiſe on them, with ſome approved receipts for their cure. I will arrange them alphabetically.

ANTICOR is a dangerous diſeaſe, proceeding from a fulneſs or inflammation of the blood, occaſioned by high feeding, without exerciſe, or by over hard riding.

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In this diſeaſe the corrupt and inflamed blood raiſes a ſwelling in the middle of the breaſt, juſt againſt the heart. Upon the firſt appearance of the ſwelling, a large quantity of blood ſhould be taken from the palate veins, or, if they lie hid, from both ſides of the neck. Then give to drink diapente with beer, adding thereto one ounce of ſugar candy, and half an ounce of treacle. Anoint the ſwelling every day with a mixture of baſilicon and hogs lard; and when the ſwelling is ſoft, let out the pus or matter, waſhing it with copperas water; then heal the ſore in the common manner.

BOTTS are a ſpecies of worms which infeſt horſes more in this country, than any other. They have large heads and little tails, and generally breed in the ſtraight gut, near, the fundament: which if not deſtroyed, are the death of the creature.

To prevent their breeding, give your horſes in the ſpring and fall, one ounce of powdered antimony and three ounces of the flour of brimſtone, which will not only prevent the botts breeding, but alſo purify their blood. And at times make a decoction of ſpice wood: that is, cut the ſpice wood ſmall, and boil it in water, and the decoction or liquor mixed

mixed with the horſe's feed, and now and then a pint of flax-ſeed. By this method, your creatures will always be kept healthy, and free from botts.

If the botts ſhould have got ahead, and are troubleſome to the horſe, (which may be known by his uneaſineſs and friſking of his tail) get one ounce of the beſt indigo, and divide it into two doſes; when powdered, give him one in the morning and the other in the evening: or, get a handful of the leaves of tobacco, and chop them ſmall, and give it him in his feed.

The FARCIN proceeds from different cauſes; as from feeding on unwholeſome hay, corn, or grain; from too high feeding, without ſuitable exerciſe; from over hard riding attended with ſudden heats and colds; or from infection from another horſe. It is a kind of venom or corruption of the blood, that appears in form of knots or cords along the veins, and by ulcers; theſe laſt are cured with a red hot iron; and the former by bleeding, purging and proper exerciſe.

The beſt preparation for the Farcin is, to ſteep the regulus of antimony in beer, with a little of the ſpice called the grains of paradiſe,

radiſe, and a little ſugar; of which give a horſe about half a pint at a time, three times a day, with a day or two's intermiſſion between each day.

The GLANDERS conſiſts in a running of corrupt matter from the noſe, being firſt white, then yellow, green, and laſtly black, when at its utmoſt malignity. It procceeds from various cauſes; from infection, a diſorder in the lungs, ſpleen, liver and brain, and in its laſt ſtage from the ſpine, and hence it is called the mourning of the chine.

In the firſt ſtage of this diſeaſe it may be eaſily cured, as its chief ſeat is in a little, ſoft, ſpongy fleſh which is eaſily dilated by the leaſt influx of blood. In the laſt ſtages there is no cure.

GRAVELLING is a diſorder which travelling horſes are liable to; when little gravel ſtones get in between the hoof and the ſhoe, they ſettle to the quick, and fret and feſter the part. It is cured by pulling off the ſhoe, picking out the gravel, and drawing the place to the quick, then ſtopping up the foot with horſe-greaſe and hot turpentine.

GALLING

GALLING is very troubleſome to the horſe and rider on a journey, and the beſt horſes are moſt ſubject to it; ſo that it concerns every traveller that goes long journies to prevent it, which may be done if the ſaddle fits well, and take a hind's or deer's ſkin, well furniſhed with hair, and fit it neatly beneath the pannel of the ſaddle, ſo that the hairy ſide may be next to the horſe; this does not harden by ſweat, but keeps the horſe from galling. This is alſo a method that ſhould never be omitted with horſes that are newly cured of ſuch a hurt, as it will prevent their falling into it again.

It is always proper to take off the ſaddle as ſoon as the horſe is brought in, and if in hot weather, to waſh his back with cold water, and examine whether the back be at all preſſed, or pinched in any part: and it will be well to examine it an hour after, to ſee what effect the ſtanding has had; for often the part hurt will not ſhew it at firſt, but will ſwell violently afterwards. In this caſe, where the ſkin is not fretted, but a ſwelling comes on, a bag of coarſe cloth ſhould be filled with horſe-dung, and tied on the ſwelling, which will not only prevent it from growing worſe, but will take it quite down; or rub the ſwelling with good brandy, laying

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on a paper ſoaked in it. If the ſkin be broken, a mixture of red wine and ſallad oil, is a good remedy.

The HAW is a griſtle growing between the nether eye-lid and the eye, which, if not timely extirpated, will put the eye entirely out. It owes its origin to tough phlegmatic humours, which falling from the head, and uniting together, form, at laſt, this infirmity.

The method of cure is as follows: The creature is to be held faſt by the head, and a needle with a ſtrong thread, is to be thruſt through the upper eye-lid, and tied to his mane. Then the needle with a long thread, muſt be thruſt through the haw, and the ſkin cut round it with a ſharp knife: the haw is plucked out by means of the thread; after which the eye muſt be cleanſed from the blood, and waſhed with beer, with ſalt diſſolved in it.

The hoof of a horſe is liable to many infirmities, ſuch as caſting of the hoof, hoof-bound, hoof-looſend, hoof-ſwelled, and brittle-hoofed.

Caſting of the hoof, is when the whole coffin of the hoof becomes looſened, and falls off

from the bone. This ariſes from ſome prick, ſtub, foundering, ſurbating, &c. that cauſes an impoſthumation in the foot, whereby the hoof, and ſometimes the coffin-bone, being ſpungy, falls off in large pieces.

Hoof-bound is the ſhrinking in of the hoof a-top and at the heel, which makes the ſkin grow over it. It is cauſed by keeping a horſe too dry in the ſtable, ſtraight-ſhoeing, or ſome unnatural heat after foundering.

Hoof-looſened, is a dividing of the horn of a horſe's hoof from the fleſh, at the ſetting on of the coronet. If the parting be round about the coronet, it comes by foundering; if in part, then by a prick, quitter-bone, gravelling, &c.

Hoof-ſwelled, is an infirmity that befals young horſes, when over ridden, or wrought hard, which makes the hoof ſwell, by reaſon of the blood falling down and ſettling there; which, if not ſpeedily removed, begets a wet ſpavin.

The brittle-hoof comes ſometimes naturally, and ſometimes artificially. When it comes naturally, it is generally hereditary, the ſire or dam having had the ſame complaint.

plaint. When it comes on accidentally, it is ſometimes owing to a diſtemper falling down into the feet; and ſometimes to the creature's being much foundered. The hoof, in this diſtember, is ſo friable and rotten, as it were, that it cracks and flakes off on every ſlight occaſion. The cure in theſe ſeveral diſorders is as follows: take bees wax, refined turpentine, ſuet, and hogs lard, of each four ounces; ſallad oil a quarter of a pint, and of dog's greaſe, half a pound; let the whole be melted together and ſtrained through a piece of canvaſs into a gallipot. The hoof is to be thoroughly anointed with this every day, morning and evening, eſpecially at the root; and, if there are any large cracks, they muſt be filled up at every dreſſing, with a mixture of equal parts of cows-dung and hogs lard.

The LAMPERS is a ſwelling in a horſe's palate, that hinders the creature from feeding, and makes him let his oats or corn fall half chewed out of his mouth. It ariſes from abundance of blood reſorting to the firſt furrow of the mouth, and from heat, &c. The cure is by burning it with a red hot iron, and afterwards anointing the place with olive oil.

The SPAVIN is a diſeaſe of which there are four kinds: two of them are ſeated on the inſide at the bottom of the ham. The other two on the inſide of the hoof under the joint. The two former is called the ox and dry ſpavin, and the two latter is called the bloody or wet ſpavin, and the bone ſpavin. The ox ſpavin is a callous tumor hard as a bone, and very painful. The dry ſpavin is more eaſily perceived by the horſes raiſing one of his hind legs, with a twich, higher than the other. The blood ſpavin is a ſoft tumor which grows through a horſe's hoof, and is uſually full of blood. The bone ſpavin is a cruſty ſubſtance growing on the inſide of the hoof under the joint. The ox and dry ſpavin is occaſioned by a kick or ſome hurt, and the blood and bone ſpavin, by ſome infirmity in the hoof. The method of cure is by bliſtering the part, and if that does not cure it, firing is the only reſource left.

The STAVERS or STAGGERS is a giddineſs in a horſe's head, which ends in madneſs. The ſigns of it are dimneſs of ſight, reeling and ſtaggering, watery eyes, &c. at length for every pain he beats his head againſt the wall, thruſts it into the litter, riſes and lies down with fury, &c. The method of cure is as follows; the creature is firſt to be blooded largely,

largely, then a glyſter is to be given him, compoſed of two quarts of emetic wine, and four ounces of the unguentum popalneum. When he has repoſed an hour or two after voiding the glyſter, let another be given him, made of two ounces of the ſcoriæ of the liver of antimony finely powdered, boiled a little while in five pints of beer, and with the addition of four ounces of the ſame ointment, or of ointment of roſes. This laſt glyſter is to be frequently repeated, and his legs to be all the while rubbed ſtrongly with wiſps of hay, wetted in warm water, to make a revulſion. His food ſhould be bran and white bread, and he ſhould be walked from time to time in ſome temperate place. If theſe methods do not ſucceed, let an ounce of venice treacle be diſſolved in a quart of ſome cordial waters, and given him; and, after this, let the following glyſter be given warm, take venice treacle and ſalpoly crestum, of each two ounces; diſſolve them in two quarts of a decoction of mallows and camomile flowers; add a quarter of a pint of oil of rice. This repeated two or three times after bleeding, and the other methods will, often cure the worſt ſtages of this diſeaſe.

WIND-GALL are bladders full of corrupt jelly, which, when let out, is thick, and of the

the colour of the yolk of an egg. They vary in ſize, but are more uſually ſmall than large. Their place is about the fetlock joint, and are often ſo painful, eſpecially in the ſummer ſeaſon, when the weather is hot, and the ground dry and hard, that they make the creature frequently ſtumble, or fall abſolutely down. The wind galls that are ſituated near the ſinews, are much the moſt painful of all, and ſooneſt make the horſe lame. The general cauſe of wind-galls is extreme work, or violent exerciſe in very hot weather, and thoſe horſes which have long joints are moſt ſubject to wind-galls.

The method of cure is to open the ſwelling about the length of a bean, and to preſs out the jelly: when this is done, apply a mixture of the oil of bays and the white of an egg, covering it with tow. Another method is, after the jelly is all ſqueezed out, to wrap round the part a woolen cloth, then applying a hot iron; this is to be rubbed over till all the moiſture is carried away; it is then to be daubed all over with pitch, maſtick, and reſin boiled together, laying tow in plenty over all.

The roweling of horſes is a method of cure frequently had recourſe to in inward ſtrains,

ſtrains, as well as thoſe about the ſhoulders and hips, as alſo for hard ſwellings not eaſily to be reſolved. I ſhall therefore give proper directions for rowelling. The operation is thus: a little ſlit being made through the ſkin, about a hand's breadth below the part aggrieved, big enough to put a turkey's quill in. The ſkin is raiſed from the fleſh, the end of the quill put in, and the ſkin blown from the fleſh upwards, and all over the ſhoulder. Then the hole being ſtopped with the finger, the place blown is beaten with a ſmall ſtick, and the wind ſpread with the hand all over, then let go. This done, horſe hair, or red ſarſenet, half the thickneſs of the little finger, is put in a roweling needle, ſeven or eight inches long; the needle is put into the hole, and drawn through again ſix or ſeven inches higher; then the needle is drawn out, and the two ends of the rowel tied together, anointing it every day, as well as before the putting it in, with freſh butter and hogs greaſe and drawing it backwards and forwards in the ſkin, to make the putrid matter diſcharge itſelf more plentifully.

Horſe balls is a cordial medicine, adminiſtered in the form of balls, of great virtue for feeding and ſtrengthening ſound, as well as healing and raiſing unſound horſes—the preparation

paration is as follows: take anniſeeds, carthamus, elicampane, cimmon ſeed, and tamariſk, of each an equal quantity, wrought into a ſtiff paſte, and thence formed into balls.—They are cleanſing and emollient, efficacious in colds, ſurfeits, and hard labour, and eſpecially uſeful where any of the chief viſcera are decayed: nothing raiſing a lean creature ſo ſoon, being partly food, and partly phyſic.

Chewing balls, are thoſe which the horſe is to keep champing, or maſticating in his mouth, a conſiderable time, without ſwallowing. Theſe are chiefly uſed for a loſt appetite, a thing very incidental to horſes. The preparation for theſe balls is this: take liver of antimony, and of aſſafœtida, of each one pound; wood of the bay-tree, and juniper wood, each half a pound, pellitory of Spain, two ounces: let all theſe be powdered together, then add as much fine grape verjuice as is neceſſary to make the whole into a paſte. This is to be formed into balls of about an ounce and half in weight, which are to be dried in the ſun.

Theſe are the chewing balls, and are to be uſed one at a time in the following manner: the ball is to be wrapped up in a linen rag,

rag, and a thread is to be faſtened to this, in ſuch manner that it may be tied to the bit of the bridle, and kept in the mouth: when the bridle is taken off, the horſe will immediately eat, and, when one ball is conſumed, another is to be tied up, and put in its place, till the intent is anſwered.

DISEASES CATTLE *are ſubject to, with the* METHOD *of* CURE.

For a cow that ſtrains in calving, when her calf haulm, udder, or bag will come down and ſwell, as much as a blown bladder. Take new milk and ſtrew thereon lin-ſeed bruiſed to powder, put it up with your hand, and let her hinder part ſtand higher for two or three days, than her fore-part.

For a cow, who, by lying on the earth and two ſoon drinking cold water after calving, her calf-haulm ſwells, and lies over the neck of the bladder, ſtopping the urine that ſhe cannot ſtale, or ſtand on her feet. Take two ſacks, and put them under her body, faſten ropes to the ends, and put them over the beam of the barn, and draw her up, that ſhe cannot touch the ground with her

feet; then let a woman anoint her hand with hogs lard, and work the calf's haulm from the bladder, that the water may have a paſſage, give her warm bedding, warm drinks, and warm cloths.

For a cow that cannot glean—Take germander and pennyoyal, a large handful of each, half an ounce of ginger, and one drachm of ſaffron, boiled in three pints of beer; ſtrain it, and when cooled, give it her to drink.

For a cow that piſſes blood—Take oak, ſhave off the outer bark, and boil it in ſpring water till it be red; alſo comfrey, ſhepherd's purſe, plantain, ſage, green hemp or nettles, of each a good handful, and boil them with the bark; ſtrain it, and put a handful of ſalt into the water; alſo, ſome allum, bole armoniac and chalk. If the beaſt is weak, give only a quart luke-warm; but if ſtrong, more; once given often ſerves, but twice will ſurely cure.

For the black or red water in cows; a diſtemper next to the piſſing of blood—Take a piece of iron, heat it hot in the fire, and put it into two quarts of milk; after let the milk cool, and give it the beaſt blood warm, and it will

will bind up the bloody iſſue, after two or three times giving.

For the blain in cows—When firſt taken, they will ſtare, and foam with their tongues out of their mouths; then immediately prick her in the noſe, or bleed her in the neck, which will keep her alive twenty-four hours; then take a handful of ſalt in about a pint of water, and give it her, then directly ram a whole egg down her throat. Sometimes they have it behind, under their tail, when a bliſter will appear; this is cured by running a hand down her fundament cloſe fingered, and brought wide out; which breaks the blain within; if not diſcovered preſently, it kills them in half an hour ſometimes.

To cure ſwellings, or ſnarled bags of cows. —Take rue, and adder's-tongue, ſtamp them together, and ſqueeze out the juice; this mix with a pound of freſh-butter from the churn, without ſalt, and make it into an ointment; of which anoint the part affected.

The rot in ſheep is the greateſt misfortune belonging to them. It is cauſed by too much moiſture, by water and ſnows, which by their weight and diſſolution, mix and waſh the graſs in with the earth, and ſo cauſe a froth

or

or ſcum, which the ſheep, through hunger and novelty, greedily devour, to their deſtruction; it is alſo occaſioned, in the ſpring or ſummer, by a putrefaction in the air or graſs, eſpecially in the valleys and marſhes, and is known, oftentimes by the cobwebs on the ground, and hedges, which hold a wet, or moiſture, and are of a poiſonous nature. Theſe cauſe a corruption in the blood, which breed plaiſes in the liver and head: this plaiſe is a live worm, about the breadth of one's finger-nail, and feeds and preys on theſe parts.

I have opened ſheep that have died with the rot, and found the liver all conſumed by theſe worms.

I had a weather ſheep took with a giddineſs, which increaſed ſo that it could not ſtand: I immediately knocked off that horn that lay next the ground, and there appeared a ſmall bladder, like that of a fiſh, which I took out, and put a little wool in the place, dipped in tar, and ſewed it up, and the ſheep did well afterwards.

Rotten ſheep will, in the beginning of the rot, fatten ſooner than ſound ones; and the way to know if they are ſound, is to feel the cod

cod of the weather, and between the legs of the ewe ; if they are moiſt and wet they are ſound : but if there is a dry wax or ſcurf, they are rotten. Alſo if the innermoſt part of the eye has ſtreaks of red, it is a ſign of ſoundneſs. Alſo if the gums are red, they are ſound ; for the gums and mouth of a rotten ſheep are always white.

When the cauſe of diſtempers are known, remedies are more eaſily preſcribed. I have before ſhewn that the cauſe of the rot is occaſioned by too much moiſture, and their devouring thoſe cobwebs that appear early in the morning.

If the ſheep was not turned into thoſe places till nine or ten o'clock, the ſun by that time will have exaled or dried up this moiſture which contains this poiſonous quality, ſo that the ſheep will not receive any injury ; and as a preventative, give them frequently ſome good hay, oats, or other grain, and ſalt two or three times a week. If you find the rot has begun, remove them if you can conveniently to ſome high dry ground, that will often knit and recover them.

To prevent and cure a rotten ſheep, that is not too far gone.—Take bay ſalt, and ſtamp it

it well, and after the ſheep has fed a day or two on clean, dry oats, put ſome of it among them, and after that a greater quantity, till ſuch time as they diſlike it; then give them clean oats a day or two, and, after that, ſerve them with the ſalt as before: this courſe being followed, until their eyes have recovered their natural colour, they will be perfectly cured.

Another receipt which I ſeldom found to fail, is the regulus of antimony ſold at the chymiſts or apothecaries. This regulus of antimony is a univerſal remedy for moſt diſeaſes in men and beaſts; it is a chemical preparation, made with crude antimony, nitre, and tartar, and ſhould be corrected with ſpice and ſugar. I have before mentioned it for the cure of the farcin or farcy in horſes. Take this regulus of antimony, and ſteep it in beer, with a little of the ſpice called grains of paradiſe, and a little ſugar; give it two or three times, with a day or two's intermiſſion between each time. To a ſheep, about two or three ounces at a time. This muſt be done in time, before the liver is too much knotted, and that may be partly known, by killing one, by which a judgment may be made of the reſt.

Another

Another receipt to prevent the rot in ſheep. Take a peck of malt and maſh it, the ſame as you brew it into beer, and make about ten gallons of liquor: then boil in this liquor, a good quantity of herbs, ſuch as ſhepherds-purſe, comfrey, ſage, plantain, penny-royal, wormwood and bl oodwort, of each a good quantity, and boil them in the ſaid liquor very well; then ſtrain them and put a little yeaſt therein; and after that put a peck of ſalt, and tun, and put it up in a veſſel. Then give it your ſheep in the ſpring or fall in wet weather; ſeven or eight ſpoonfuls apiece once every week. If the weather is dry, you need not give it them ſo often. If you give them now and then a lick of tar mixed with herb-de-grace chopped, it will cleanſe the bowels of much corruption, and be healthful to the blood.

For the ſkit or looſneſs in ſheep—Take ſalt, allum and chalk, and give it in ſmall drink or water, and it will knit and help them preſently.

By frequently ſeeing my ſheep in the pen collect together in a circular manner, with their heads or noſes cloſe to one another, made me make obſervations to know what could be the reaſon. I have ſeen large flies about the heads

of

of the ſheep, and their attention or direction ſeemed to be at the noſe of the ſheep, which was the cauſe of the ſheep huddling ſo cloſe together to prevent them. This female fly, when ſhe has been impregnated by the male, knows that the noſe of a ſheep is the only place for her to depoſit her eggs, in order to their coming to good. The frontal ſinuſes above the noſe in ſheep are the places where theſe worms live and attain their full growth. Theſe ſinuſes are always full of a ſoft white matter, which furniſhes theſe worms with a proper nouriſhment, and are ſufficiently large for their habitation; and when they have here acquired their deſtined growth, and come to the ſtate in which they are fit to undergo their changes for the fly-ſtate, they leave their old habitation, and falling to the earth, bury themſelves there; when theſe are hatched into flies.

The head of a ſheep makes a good diſh: but theſe live worms found in the head,(which is miſtaken by many for maggots)has brought that part of the ſheep into diſrepute. I happily found a remedy which prevented the fly from laying her eggs; which was mixing flour of brimſtone with ſalt,and giving it frequently to the ſheep to lick. The fumes of the brimſtone aſcending into that part of the head

head made it noxious to the fly. My ſheep afterwards fattened much ſooner; for the worms plagued them much by tickling the part, which might be ſeen by the ſheeps uneaſineſs, and frequently ſhaking their heads.

To cure the ſcab or itch, all maggots, and worm in the claw. Let the ſheep blood in the eye veins. Take tar and hogs lard of each a like quantity, mix them well together with ſome flour of brimſtone and the juice of cherville; bring it to a ſalve, and with the ſame (after you have bared, cleanſed, and made all the ſore places raw) anoint all the grieved places.

To cure broken bones, or bones out of joint. After you have placed the member right (which you may do by the example of the ſound member) bathe the grieved place well with butter and beer; then make a ſear-cloth of patch-greaſe and yellow wax, and warming it very hot, lap it about the member, and if need require, ſplinter it; and in caſe the member be broken, renew it not till fifteen days be paſt, otherwiſe once in three days.

To cure griefs in the mouth, and looſeneſs of teeth. Let the ſheep blood in the gums, then take of earth, ſage, and ſalt of each an equal

quantity, beat them well together, and with the ſame rub the mouth of the ſheep very well, but eſpecially where it is grieved.

To rear weak lambs, and cure lambs that are yeaned ſick. Take up the lamb, and breathe into the mouth thereof. Then put it to its mother's tits; if the ewe has no milk, or the lamb has not ſtrength to ſuck, feed it with mare's milk and a little water mixed together made lukewarm, and in any caſe during the ſickneſs, or weakneſs, keep it very warm; for that is the greateſt nouriſhment that can be given, and agrees the beſt.

TO MAKE CHEESE.

The Engliſh method is as follows. To let the runnet be prepared by ſoaking the calve's bag in cold water and ſalting it enough to keep it ſweet——To the milk, firſt made blood warm, add enough of this to turn the milk into a curd in half an hour. Which quantity will ſoon be found by experience; then heat it as hot as you can well bear your hand in it; and having ſtrained the whey well from it, break or chop the curd to pieces; and to every five pounds of cheeſe put a tea-

ſpoon

ſpoonful of refined ſalt petre, and a large ſpoonful of common ſalt. Experience will ſoon teach you how much milk or curd will produce five pounds of cheeſe. It muſt now be put into the preſs, which you may have of any ſize from ten pounds to eighty: the cheeſe muſt be turned within an hour after it is firſt put in, and kept in the preſs two days. Turn it twice the firſt day, and once the laſt. They ſhould while drying be kept in a dark room, or ſome other place where the flies cannot come; they ſhould be turned on the drying ſhelf once every day. If any crack come in them when drying, let them be filled with paſte, made of butter and flour, to keep the flies from coming at them, if any ſhould get into the room.

A new method to make BUTTER *from St. Foine Graſs.*

In the firſt place the land where you intend for ſowing of this graſs muſt be prepared for its reception, by bringing it into a very fine tilth, and cleaning it well from all ſorts of weeds: for weeds will ſoon choak and kill the young plants. This graſs will grow on the drieſt land you have: wet lands, as I have before obſerved, on the cultivation of this

valuable graſs, will rot the roots and kill it.

The time required for preparing the land, and before it comes to its proper perfection, will be three years; for it muſt not be cut the firſt year. This will give you time to erect your dairy and collect a ſtock. For the proper cultivation of it, I refer the reader to my deſcription of that graſs.

To know the quantity of land ſufficient for your ſtock. Obſerve the worſt acre of twenty, which quantity of land is moſt ſuitable for this purpoſe, improved by this graſs, will very well maintain four cows from the firſt of May to the firſt of December, and afford, beſides a ſufficient ſtore of hay, to make good part of their ſubſiſtence the other four months. Nothing is ſo ſweet, nothing ſo innocent, as this St. Foine; but above all, it is obſerved to increaſe milk, in quantity and quality, beyond any graſs yet known in the whole world; and it is for this reaſon that I adviſe you to keep cows upon it, and make you a dairy. A ſmall plantation of thirty acres, improved by this graſs, will be ſufficient for a hundred cows.

Theſe

Theſe cows ſhould be freſh, or new milch ones. The cows will keep freſh for twelve months, when they ſhould be ſold, and freſh ones bought in their room;—this may be done with very little loſs, if any. I have frequently ſold them for more than what I have bought a freſh one for, as they have been fat and fit for the butcher; you will find it will be to your advantage to have no bulls.

For one hundred cows, you muſt erect two ſheds riſing ſufficiently in the middle to carry off the water; the height in the middle may be twelve feet, and the ſides ſeven feet, and the breadth thirty feet; each of the ſheds ſhould be one hundred and twenty-five feet long; and under the higheſt part, directly in the middle, muſt be a partition, which will ſupport the ridge of the roof; on either ſide of the partition, let there be fixed a rack like thoſe in ſtables, which is to run the whole length of the ſhed, and muſt be placed as high as a cow can reach her fodder from. The ſhed muſt next be divided into ſtalls of five feet broad; the length of theſe ſtalls muſt be exactly fitted to that of a cow, that a croſs bar being placed at the outer end, may keep the beaſt from running backward.

Thus

Thus each ſhed will hold fifty cows, five and twenty on each ſide of the partition; to each of theſe ſheds you muſt appoint a man whoſe buſineſs will be to clear the place, and carry off the dung; as alſo to mow the St. Foine every day, and give it to the cows in the racks before mentioned. This man beginning at one end of his proportion of ground, and going gradually on to the other; the firſt place will always be fit to mow again by that time he has gone through the whole.

Your cows will be thus fed at diſcretion, with neither too much nor too little, and they will not be ſo much peſtured with the ſcorching heats, or the ſtinging flies, which in open paſtures, often makes them whiſk about, and trample down more graſs than they eat.

Your dairys muſt be erected in the centre of theſe ſheds, that it may have a communication at the end of each ſhed, or cow houſe.

The dairy muſt be the ſame breadth of the cow houſes, and thirty feet long, and ten feet high, which is to be divided the croſs-way by a partition, which will make two ſeparate dairy's,

dairy's, whoſe dimenſions will be thirty by fifteen feet, and muſt be paved with brick, ſtone or tiles: each dairy will require two dairy maids.

All along both ſides of the partition, at about a foot above the ground, let there be fixed, cloſe to the wall, a ſtrong pipe of lead, a little leſs than an inch diameter; both which pipes, being ſomewhat raiſed exactly in the middle of the ſhed, muſt have a gentle and almoſt an inviſible deſcent from that raiſing to the dairies, through the wall of which their nether ends are to be brought, and there wrought into one another, that whatever deſcends through them, into either of the dairies, may have iſſue but at one mouth. This mouth of the pipes, muſt be made very ſmall, and neatly fitted into the hollow end of a ſtrong wooden axle-tree; which, whilſt it is turning ſwiftly round the mouth of the pipe, may by no means ſtrain by the motion, but receive, into its own hollow, the milk which deſcends through the leaden pipes, without ſpilling any, and paſſes ſo far through a wheel, or veſſel like a barrel, only much larger in its circumference. The axle-tree which this veſſel is to turn upon, is bored very full of round holes, through which it delivers the milk into the veſſel,

veſſel, as faſt as it receives it from the pipe.

The veſſel muſt be capable of containing at leaſt three times the quantity of milk, which it is deſigned to receive; and there muſt be ſix wings, or thin pieces of wood, glued on edgeways to the wooden axle-tree, whoſe length and breadth, muſt be ſo contrived, as to leave a free ſpace of ſix inches at either end of the axle-tree, and a foot between their edges lengthways, and the ſmooth inſide of the veſſel; in the moſt convenient part of which, muſt be contrived a door, to open and ſhut down upon occaſion, as cloſely as if there was none. This door will perform its work very neatly, if you line the inſide and edges with ſome kind of cloth, which is commonly uſed in the preſſing of cheeſe.

The other ſolid end of the axle-tree muſt extend itſelf above five feet longer; and the whole length may be ſupported by ſquare wooden poſts, and turn in their tops, which are to be made hollow, and kept greaſed for that purpoſe. This end of the axle-tree is to be faſtened into a wheel, exactly like thoſe which are uſed in many places for roaſting of meat. The diameter of this laſt wheel muſt be within ſix inches of the height of the da-

iry,

iry, and two large dogs, being put into it at a time, will turn it with extraordinary ſwiftneſs; which will bring the butter in a ſhort time.

The dogs will be eaſily taught, and will at laſt take delight in the exerciſe. I have ſeen a large buck, brought to the practice of this labour, and it was wonderful to ſee the force he would run round, for an hour or two together. This wheel muſt be hollow, properly incloſed, with a door for the dogs to go in and come out, and it muſt be made as light as it poſſibly can, for it to hold together.

I have but one thing more to ſay, and ſhall finiſh this direction; pretty near that ſide of every ſtall in your ſhed, to which the maid muſt come to milk the cow that belongs to it, let a hole, as ſmall as will ſerve the occaſion, be contrived by your plumber, in the uppermoſt part of the leaden pipe, to ſhut and open with a little ſcrew, which ſcrew, for fear of loooſing it, may be faſtened by a little iron chain to the body of the pipe.

I have endeavoured in the deſcription of all this, to make my meaning as plain as poſ-

ſible; If you do not comprehend it at firſt, you will after two or three times reading, and conſidering it.

The author having more room than he firſt imagined, is willing to introduce ſomething uſeful, and being of opinion that many foreign ſhrubs and plants, might be eaſily imported into this country, and that the introduction of which, would be attended with very great profits to the planter; and the advantage that may be derived to the commonwealth from their introduction, increaſe and culture, muſt appear ſufficiently obvious, when we conſider the enormous expence we are at, in purchaſing foreign wines, drugs, dye ſtuffs, &c. The many advantages we have more than any other country, having ſuch a diverſity of climate, of ſoil, and of ſituation, leaves not a doubt, but they may be cultivated here, to as great an advantage, as they are in their own native ſoil, and climate.

I regret in not having room to treat on all of them, that is uſeful; but as that would ſwell my treatiſe far beyond its limits, I muſt defer the remainder, to my next edition; contenting myſelf with a few of thoſe that rank

rank firſt; therefore ſhall firſt begin with the vine.

VINEYARD.

The beſt ſituation for a vine-yard is on the declivity of a hill lying to the South: and the ſoil moſt ſuitable, is the hotteſt gravel, ſand, or dry rocky ground, provided it be well watered and ſhaded. To mend a ſoil that wants thoſe qualities, it is good to throw in the rubbiſh of old buildings, well mixed with twice as much earth, and ſifted about the roots of the vines. The vines moſt ſuitable for the midling or colder climates are the white Muſcadine, the Burgundy, the Claret, the Parſly, the Muſcadine, the white and red Frontigniac, and the Arbois, or French ſweet water grapes. The ſouthern climates will produce all the reſt as well as thoſe.

The vine is propagated by ſlips, layers, or cuttings. If you propagate them by cuttings, let ſuch be choſen as are ſtrong, and well ripened ſhoots, of the laſt year's growth, and ſhould be cut in the fall of the year, from an old vine, juſt below the place where they were produced, taking a knot of the two years wood,

wood, which ſhould be pruned ſmooth. The upper part of the ſhoot muſt be cut off, ſo as to leave the cutting about ſixteen inches long. If for exportation the lower parts of theſe cuttings muſt be put in mould in a tub and ſhould be kept in ſome part of the ſhip till their arrival where the air could be admitted to them. If cut for a new plantation, in the ſame place theſe cuttings are to be placed, with their lower part in the ground in a dry place, laying ſome litter about their roots to prevent them from drying. In this place they ſhould remain to the beginning of April, which is the time to plant them. They are then to be taken up and wiped clean, and their lower parts to ſtand in water ſix or eight hours. Then having prepared your ground to receive them. They are to be planted in lines running North and South, five or ſix feet a part; only two vines in each hole. You muſt have ſpare ones in your nurſery, to make good them that miſs; thoſe you have planted muſt be kept clean from weeds. The fall following, if the cuttings have produced ſtrong ſhoots, they ſhould be pruned down to two eyes. In the ſpring following the ground is carefully to be dug up about the ſhoots, and the ſtalks to be earthed up to the firſt eye. During the ſummer all the lateral ſhoots muſt be rubbed off

as

as they appear, and only the two from the two eyes, which were left muſt be encouraged; theſe as they grow, muſt be ſupported, with ſtakes and laths in the manner of an eſpalier; and in the middle of July theſe muſt be ſhortened by nipping off their tops, and this will greatly ſtrengthen the ſhoots. In the following fall theſe ſhould be pruned, leaving them each three eyes, if they are ſtrong, but if they are weakly, only two. The next ſummer there will be two ſhoots from each ſhoot of laſt year's wood; but if there ſhould be two from one eye, which is ſometimes the caſe, then the weaker is to be rubbed off. At midſumer the ends of the ſhoots are to be picked off, as before; all the weak lateral ſhoots, are to be diſplaced, as in the preceding ſummer; and the whole management is to be the ſame.

If, notwithſtanding due pruning, they do not ſeem inclinable to bear large bunches, the ground muſt be helped with a dreſſing from the compoſt heap, with an equal quantity of drift or other ſand. Thus managed, a vineyard in five or ſix years will produce a good ſtore of grapes.

A vine-yard at Bath, in Great-Britain, containing about ſix acres of ground, planted with

with white muſcadine and black cluſter grapes, by ſuch management as before mentioned, has produced or yielded ſixty hogſheads of wine at a vintage; as good wine, and as fine flavored as any ever imported.

As to the management of grown vines, it is to be obſerved, that theſe rarely produce any bearing ſhoots, from wood that is more than a year old, the great care muſt therefore be, always to have plenty of this wood in every part of the tree.

The bearing ſhoots for the following year, ſhould be left at the pruning with four eyes each. The under one of theſe does not bear, and conſequently there are only three which do. Many leave more eyes on the ſhoots, that they may have the more fruit, which is the conſequence; but then the fruit is much poorer; and this is ſo well known in the wine countries, that there are laws to direct, that no more than ſuch a number of eyes are to be left on each ſhoot, for the grapes would elſe be of a poor juice, and deſtroy the reputation of the wine.

Each of the three eyes left, will produce two or three branches; ſo that each ſhoot will

will produce ſix or nine bunches, which is as much as it can bring to any perfection.

Theſe ſhoots muſt be laid in at about eighteen inches aſunder on the eſpalier; for if they are cloſer, when the ſide ſhoots are produced, there will be no room to train them in againſt the eſpalier: and the largeneſs of the leaves of the vine, requires alſo that the ſhoots ſhould be at a proportionable diſtance.

The beſt ſeaſon for pruning vines is in October. The cut is always to be made juſt above the eye, and ſloped backwards from it, that if it bleed, the juice may not run upon the bud; and where there is an opportunity of cutting down ſome young ſhoots to two eyes, to produce vigorous ſhoots for the next year's bearing, it ſhould always be done.

In May, when the vines are ſhooting, they ſhould be looked over, and all the ſhoots from the old wood rubbed off, and alſo the weaker, whenever there are two produced from one eye.——During the month of May, the branches muſt be faſtened to the eſpaliers, with withes or baſs, as they ſhoot; and towards the latter end of the month, the ends

of

of the bearing branches ſhould be nipped off, which will greatly ſtrengthen the fruit. Thoſe, however, which are to bear the next year, ſhould not be topped before the beginning of July.

WINE.

The difference of flavour, taſte, colour, and body, in wines, is as much owing to the different manner and time of preſſing, gathering, &c. the grape, as to any difference of the grape itſelf.

In Hungary, whence tockay and ſome of the richeſt and higheſt flavored wines come, they are extremely curious in theſe reſpects. For their prime and moſt delicate wines, the grape is ſuffered to continue upon the vine, till it is half dried by the heat of the ſun; and if the ſun's heat ſhould not prove ſufficient, they are dried by the gentle heat of a furnace, and then picked one by one from the ſtalks. The juice of this grape, when preſſed out, is of a fine flavour, and ſweet as ſugar; this, after due fermentation, is kept for a year, and then racked from the lees, when it proves a generous

generous, oily, rich wine, and is ſold at a very high rate.

The Hungarians prepare a ſecond ſort of wine, by collecting together the better kind of grapes, carefully picking the grapes from the ſtalks, and then preſſing out the juice.—This is extremely ſweet, and is made richer by infuſing in it after it has fermented ſome days a ſufficient quantity of half-dried grapes. This wine is very ſweet, oily, and of a grateful taſte, and retains theſe qualities for a long time. There is a third ſort made from the pure juice of the ſame kind of grape, without any addition. This is a more brisk and lively wine, and far leſs ſweet.

They likewiſe prepare a fourth ſort, from grapes of different goodneſs mixed together; this, though not ſo generous, is nevertheleſs an excellent wine.——Theſe Hungarian wines are remarkable for preſerving their ſweetneſs, and for the delicacy of their taſte, and ſmell; they likewiſe do not grow eaſily vapid, and may be kept in perfection for many years.

RAISINS.

Raiſins are the fruit of the vine ſuffered to remain on the tree till perfectly ripened, and then dried, either in the ſun, or by the additional heat of the oven. Grapes of every kind, preſerved in this manner, are by authors called paffulæ, and accordingly diſtinguiſhed in ſeveral kinds, according to the ſpecies of grape.

What we have at preſent, differ, as they are better or worſe dried, and are called raiſins under different additional denominations.

The difference between raiſins dried in the ſun, and thoſe dried in ovens, is very conſiderable and obvious. The former are ſweet and pleaſant, the others have a whitiſhneſs, and a latent acidity, with the ſweetneſs that renders them much leſs agreeable.

The raiſins of the ſun, and what is called jar raiſins, from their being imported in earthen jars, are all of the former kind.

The

The common raiſins are the fruit of ſeveral ſpecies of grape, which are better or worſe, according as they have been more or leſs carefully cured, by drying them in ovens.

The common way of drying grapes for raiſins is to tie two or three bunches of them firmly together while yet on the vine, and dip them into a hot lixivium of wood aſhes, with a little oil of olive in it, this diſpoſes them to ſhrink and wrinkle, and after they are left on the vine three or four days, ſeparated on ſtalks in a horizontal ſituation, and then dried in the ſun at leiſure, after cut from the tree.

FIGS.

The fig-tree, ficas vulgaris, or ficus ſativa, in botany, is one of the cryptogamia of Linæs, and the abores flore fructuque aggregato of Ray. Theſe trees are propagated from the ſeeds: the method is to ſow the ſeeds in the nurſery at one foot diſtance in the rows, and four feet between. When planted out, if in warm countries, they are planted as ſtandards; but in colder climates, they are gene-

generally planted againſt walls or eſpaliers. Its flowers are contained within the very fruit itſelf.

The eſpaliers will be beſt for the middling and colder parts of this country; but to the ſouthward, ſtandards.

In Germany, although ſo cold a climate, they are cultivated to a great advantage. Their method is, in the fall of the year to untie the fig-tree from the eſpalier and lay them down, covering them from the froſt with ſtraw or litter, which prevents their ſhoots from being injured by the froſt; and this covering is taken away gradually in the ſpring, and not wholly removed, until all the danger of froſt is over; by which management they generally have a very great crop of figs.

In Italy and the other warm countries, the firſt crop of figs is little regarded, being few in number; for it is the ſecond crop of figs, which are produced from the ſhoots of the ſame year, which is the principal crop there.

It is ſingular that the wounding of the fruit of the fig by inſects is a great means of its ripening well. In ſome of the iſlands of the

the Levant, they collect the fruit of the wild fig in June or July, at which time the worms, produced in them by the eggs of inſects, begin to change into flies. They hang theſe fruits on the branches of the domeſtic fig-tree; and the flies, as they come out of them, naturally ſettle upon the growing figs about them, making punctures or wounds in the fruit, which cauſes them to ripen in much greater numbers and perfection than they otherwiſe would. But these figs are baked, before they are packed up for uſe, in order to deſtroy the eggs depoſited in them by the flies, which would otherwiſe hatch into worms and ſpoil them. The beſt ſeaſon for pruning of fig-trees is in autumn, becauſe, at that time the branches are not ſo full of ſap; ſo they will not bleed ſo much, as when they are pruned in the ſpring, and, at this ſeaſon the branches ſhould be diveſted of all the atumnal figs; and, the ſooner this is done when the leaves begin to fall off, the better will the young ſhoots reſiſt the cold of the winter.

There are ſome ſeaſons ſo cold and moiſt that the young ſhoots of the fig-tree will not harden, but are ſoft and full of juice; when this happens, there is little hopes of a crop of figs the ſucceeding year; for the firſt froſt in the fall will kill the upper part of theſe ſhoots for a conſiderable length downwards: when-

ever this happens it is the beſt way to cut off all the decayed parts of the ſhoots, which will prevent the infection, from deſtroying all the lower part of the branches; and by this method I have ſeen a moderate crop of figs put out from the lower part of the ſhoots, where if the ſhoots had not been injured, there would have been no fruit produced; becauſe it is chiefly from the four or five uppermoſt joints of the ſhoots that the fruit comes out; and it is for this reaſon, that as many of the ſhort lateral branches ſhould be preſerved as poſſible: thoſe being the moſt productive of fruit; for where the long ſtraight ſhoots are faſtened up, there will be no fruit, but at their extremities; ſo that all the lower parts of the trees will be naked, if there is not a particular regard had to ſupply young ſhoots in every part of the tree.

The trees which are laiddown from the eſpaliers, ſhould not be faſtened up again, till the beginning of April, for the reaſons before given: during the ſummer ſeaſon theſe trees will require no pruning, but the branches are often blown down by winds; therefore, whenever this happens, they ſhould immediately be faſtened up again, otherwiſe they will be in danger of breaking; for the leaves of theſe trees being very large and ſtiff, the wind has great

great power on them: ſo that where the branches are not well ſecured, they are frequently torn down

Thoſe trees which are planted againſt eſpaliers, may be protected from the injury of froſt in the ſpring, by placing reeds on each ſide of the eſpalier, which may be taken down every day, and put up again at night; but this need not be practiſed in warm weather, but only at ſuch times as there are cold winds, and froſty mornings; and, although there is ſome trouble and expence attending this management, yet the plentiful crops of figs, which may be this way obtained, will ſufficiently recompence for both.

The beſt way of making this covering is, to faſten the reeds with rope yarn, in ſuch a manner, as that it may be rolled up like a mat, ſo that the whole may be with facility be put up, or taken down; and if theſe reeds are carefully rolled up, after the ſeaſon for uſing them is over, and put up in a dry place, they will laſt ſeveral years.

There is another method, by faſtening as many of the branches together as can be conveniently brought into a bundle, and winding ſome hay or ſtraw bands round them

them, which in the ſpring may be gradually taken off, ſo as not to expoſe the ſhoots all at once to the open air; and if there is ſome ſuch light covering, laid round the ſtems, and upon the ſurface of the ground, about their roots, it will more effectually ſecure them from the dangers of froſt; but when this is practiſed, great care ſhould be taken, that no mice, or rats, harbour in this covering; for theſe will eat off the bark from their ſhoots, and kill them.

The fig is cured in much the ſame manner as the grape into raiſins. They muſt firſt be dried in the ſun, and then put in the oven, to kill the inſect, that breeds in them.

ALMONDS.

The almond tree, called amygdalus, in botany, is a beautiful tree which produces the almonds; the fruit is pleaſant as well as medicinal; it is contained in a hard ſtone full of little cells, which is incloſed in a tough cottony ſkin. The tree which produces this fruit, nearly reſembles the peach, both in leaves and bloſſoms. It grows ſpontaneouſ-

ly

ly, only in the warmer countries, as Spain, and particularly Barbary, flowering in the ſpring, and the fruit is ripe in Auguſt.

Almonds are chiefly of two kinds, ſweet and bitter.—The ſpecies are: 1. Amygdalus ſativa, fructu majore. C. B. P. the common large almond. 2. Amygdalus dulcis, putamine mollion. C. B. P. the ſweet almond with tender ſhells. 3. Amygdalus amara. C. B. P. the bitter almond. 4. Amygdalus ſativa, flore albo. The white flowering almond.

They are propagated by inoculating a bud of theſe trees into a plumb, almond, or peach ſtock, in the month of July. (The manner of this operation you will find under the article Inoculating, page 236.) The next ſpring, when the bud ſhoots, you may train them up either for ſtandards, or ſuffer them to grow for half ſtandards; though the beſt method is to bud them to the height the ſtems are intended to be; and the ſecond year, after budding, they may be removed to the places where they are to remain.

The beſt ſeaſon for tranſplanting of them (if for dry ground) is in October, as ſoon as the leaves begin to decay: but for a wet ſoil, March or beginning of April is much preferable; and obſerve always to bud upon plumb

ſtocks, for wet ground; and almonds or peaches for dry. The almond with white flowers, is more difficult to increaſe than any of the other, and will not take upon a plumb-ſtock, ſo muſt be budded on either peach or almond.

The common large almond produces almoſt every year large quantities: therefore will yield the greateſt profit to the planter.

The almond is cured the ſame as walnuts, firſt dried and then ſeparated from the cottony ſkin.

LIQUORICE.

Liquorice, or liquoritia, glycyrrhiza, and radix dulcis, is a ſweet root of conſiderable uſe in medicine. The plant is one of the diadelphia decandria of Linnæus, and of the herbæ flore papilionaco ſew, leguminoſæ of Mr. Ray. It grows wild in many parts of France, Spain, Italy and Germany, and is cultivated in England in great abundance, and to much profit: and by the good order they keep the ſoil in, produces better roots, longer, evener and more ſuculent than any from any other

other part of the world: but the reſt of Europe as well as America, is in a great part furniſhed by what grows about Bayonne and Saragoſſa in Spain, made up into rolls and cakes, covered with bay leaves, and is in general called Spaniſh juice. A great deal of it is adulterated with a mixture of ſand and other filth. If it is good it will be firm but not tough, hard, and when broke, of a fine, ſhining ſurface, ſuch as perfectly melts in the mouth, and does not taſte of burning, nor leaves any harſh or gritty particles between the teeth.

The cultivation of this plant is as follows: —The ground deſigned for it muſt be well dug and dunged the year before, that the dung may be thoroughly rotted in it; and juſt before it is planted the earth is to be dug three ſpades deep, and laid very light. The plants to be ſet muſt be taken from the ſides or heads of the old roots, and each muſt have a very good bud or eye, or otherwiſe they are ſubject to miſcarry; they ſhould alſo be about ten inches long, and perfectly ſound.

The ſeaſon for planting them is as early in the ſpring as the weather will admit, and this muſt be done in the following manner: the rows muſt be marked by a line drawn acroſs the

the bed at two feet diſtance; and the plants muſt be ſet in theſe rows, by making a hole of their full depth and ſomething more, and the eye of the root may be an inch below the ſurface; they muſt alſo be ſet two feet diſtance from each other in the rows. When this is done, the ground may be ſown over with onions or turnips, which not rooting deep, will do the liquorice roots no injury for the firſt year.

In the fall, when the ſtalks of the liquorice are dead, a little very rotten dung ſhould be ſpread over the ſurface of the ground. Three years after the time of planting, the liquorice will be fit to take up for uſe; and this ſhould be done juſt when the ſtalks are dead off: for, if taken up ſooner, the roots are very apt to ſhrink greatly in their weight.—There is one neceſſary caution, that is, the ground muſt be kept hoed, and free from weeds.

The manner of preparing the juice in Spain is this: they take up the roots in the month of July, they clean them perfectly as ſoon as taken out of the earth, and then hang them up in the air till nearly dry; after this they cut them into thin ſlices, and boil them in water till the decoction is very ſtrong; they then preſs it hard out to obtain all the juice

they

they can from the root. They ſet this decoction by to ſettle a little, and when it has depoſited its coarſeſt parts, they pour it off into veſſels, in which they evaporate it over a fire ſtrong at firſt, but milder afterwards, till it becomes of the conſiſtence of a thick extract; they then let the fire go out, and, when the extract is ſo cool that they can handle it, they take out large parcels at a time, and working them well in the hands, they roll them out into long cylindric maſſes, which they cut out into ſuch lengths as they pleaſe, rolling them over a parcel of half dried bay leaves, which pick up enough of them for a covering, which are in that condition laid in the ſun till perfectly dried; there is great nicety required, at the end of the evaporation to get the extract to a proper conſiſtence without letting it burn.

MADDER.

Madder is a ſmall red root uſed in medicine and dying.——The plant which produces the madder root is of the number of the tetrandia monogynia of Lynnæus, and one of the herbæ ſtillatæ of Mr. Ray.

It

It grows to two feet high, its ſtalks are ſquare and rough ; its leaves are oblong and narrow, and ſtand four in a joint in the manner of a ſtar. Its flowers grows in cluſters at the upper parts of the ſtalks, are very ſmall and of a pale yellowiſh green colour ; theſe are followed by a fruit conſiſting of two ſeeds. It has been deſcribed by all the botanical writers under the names of rubia ſtava, and rubia tinctorum.

Madder is cultivated in vaſt quantitities in ſeveral parts of Holland ; the Dutch ſupply all Europe with it, and make a vaſt advantage of the trade in it ; it is very wonderful no other nation has attempted the cultivating of it, as it would ſucceed in almoſt any country, particularly in this, and much ground might be employed in this way, to ten times the advantage it is at preſent.

A flat loamy ſoil ſuits it beſt.—The method of cultivating this uſeful plant, as practiſed by the Dutch, is as follows : In the fall of the year, they plow the land where they intend to plant madder in the ſpring, and lay it in high ridges, that the froſt may mellow it.

In

In march they harrow it down and plow it again; and at this ſeaſon they work it very deep, laying it up in ridges eighteen inches aſunder, and about a foot high; then about the beginning of April, when the madder will begin to ſhoot out of the ground, they open the earth about their old roots, and take off all the ſide ſhoots, which extend themſelves horizontal, juſt under the ſurface of the ground, preſerving as much root to them as poſſible; theſe they tranſplant immediately upon the tops of the new ridges, at about a foot apart, obſerving always to do this, when there are ſome ſhowers, becauſe then the plants will take root in a few days, and will require no water.

When the plants are growing, they carefully keep the ground hoed, to prevent the weeds from coming up between them; for if they are ſmothered with weeds, eſpecially when young, it will either deſtroy or weaken them ſo much, that they ſeldom do well after. In theſe ridges they let the plants remain two ſeaſons, during which time they keep the ground very clean; and in the fall, when the tops of the plants are decayed, they take up the roots and dry them for ſale.

The

The experiments I have made on the culture of madder in England, convinces me there is no neceſſity for planting it on ridges, except the land is very wet, as is the caſe in general in Holland, where their land is often floated in winter. In dry land the beſt method is to plow between the ridges, therefore ſhould be planted at a greater diſtance, than is practiſed by the Dutch. The rows ſhould be four feet between, and the plants eighteen inches aſunder in the rows, as they extend themſelves pretty far under ground; for where they are planted too near, their roots will not have room to grow. For I find, that if all the horizontal roots are deſtroyed from time to time, as they are produced, it will cauſe the large downright roots to be much bigger, in which the goodneſs of this commodity chiefly conſiſts; for, if the upper roots are ſuffered to remain, they will draw off the principal nouriſhment from the downright roots, as I have experienced; for I planted a few roots upon the ſame ſoil, and ſituation, which were of equal ſtrength, and rooted equally as well: half of theſe I hoed round, and cut off the horizontal roots, and the other half I permitted the horizontal roots to remain on; and when I took them all up, thoſe which I had hoed about, and kept clear from horizontal roots, were almoſt as large

again

again as the other, and the roots were double the weight; which plainly proves the neceſſity of cutting off thoſe ſuperfluous roots, ſo that where this plant is cultivated in quantity, it will be an excellent method to uſe the hoe-plow I have before deſcribed: for with this inſtrument a large quantity of ground may be kept clean at a ſmall expence: and as this will ſtir the ground much deeper than a common hoe, it will cut the ſuperficial roots and thereby improve the principal roots.

The crop of madder ſhould be ſhifted into freſh land; for the ground which has had but one crop, will not be fit to receive another in leſs than four years; during which time, any other annual crop may be cultivated on the land.

The manner in Holland, of drying and preparing theſe roots for uſe, is as follows. They pare off the outſide rind of the roots, which is dried by itſelf, and is called mull madder. Then they pare off another fleſhy part of the root, which is made into another madder, and is called number O: but the inſide or heart of the root, is called crop madder. The firſt ſort is worth about twenty ſhillings per hundred weight, the ſecond ſort about

about forty ſhillings, and the third ſort five pounds. This method I believe they do not now practice: but the whole is dried and ground together, which anſwers the dyers purpoſe full as well.

Theſe roots muſt be dried on a kiln, before they are ground to powder. What is for medicinal uſe, comes in the whole root, which is only dryed, without any preparation.

By my experiments which I made, I imagine that one acre of good madder when fit to take up for uſe, will be worth upwards of one hundred pounds. So that it will well pay for any method of culture; but if performed by the plow, will be no great expence, the principal charge being, in the firſt preparing of the land, and the planting.

RHUBARB.

Rhubarb, is a thick root, of an oblong figure, large at the head, and tapering pretty ſuddenly, as it extends in length. It is ſometimes ſingle, but more uſually divided into two or three parts at the lower end; it is from four to ſix inches in length, and three or four in

in diameter at the top. It is of a tolerable ſmooth and even ſurface, and externally of a faint yellow colour, with a large admixture of brown; it is moderately heavy, but not hard: when freſh cut, it is found to be of a marbled and variegated appearance; its colours are a pale, but bright yellow, and a faint reddiſh; the yellow is the ground colour, and the red is diſpoſed in ſhort irregular veins, much in the manner of the darker colour in the common nutmeg.

It is of a ſomewhat lax and ſpongy texture; it has an agreeable, and ſomewhat aromatic ſmell, and a bitteriſh, aſtringent, and ſubacid taſte.

The plant which produces the true rhubarb, is of the ennardria, tryginia of Linnæus, and the Rhabarbarum folio oblongo criſpo, undluato, flabellis ſparis, of Juſſieu, and thelapathum bardanæ folio undulato glabro, of Mr. Rand.

The root of the native rhubarb plant is long, thick and perennial; its bark, while growing, is of a browniſh red colour, but under this the ſubſtance of the root is of the true colour of dried rhubarb, only deeper.

A numb

A number of large leaves are firſt produced from the root; they are of a fine green, elegantly undulated at the edges, of an oblong figure broadeſt at the baſe, and ſomewhat auriculated; they ſtand on very thick and fleſhy pedicles, moderately long, convex in their under part, and flat on the upper; theſe divide each into five large and prominent ribs, running with many diviſions through the whole leaf; in the midſt of theſe leaves riſes a ſtalk of an angular compreſſed figure, ſtreated and riſing to about three feet high, which from the middle to the top, is furniſhed with a cluſter of little flowers, ſurrounding it at certain diſtances; they are very ſmall and white, and are ſucceeded each by a ſingle ſeed of a triangular figure. It flowers in June, and ripens the ſeed in July and Auguſt. It is produced in great plenty on the confines of China and Tartary, and in many parts of Tartary itſelf: the mountains of Tibet abound with it, and a very conſiderable part of what is ſent to Europe and America grows there. This plant will grow beſt in high, dry, warm land; it will ſtand the ſevereſt colds unhurt.

The cultivation of this plant is the ſame as the madder before deſcribed, only they require a greater diſtance between the rows.

The

The Chineſe are very careful in their manner of drying it; they take up the root only in winter, or early in the ſpring before the leaves begin to appear; they then cut it into ſmall pieces as they think proper, and lay it on a table in a ſhady place, turning it once or twice a day, for two or three days; after this they ſtring the pieces on a cord at a diſtance from one another, and then hang them up in a ſhady place, where they may dry leiſurely. It is by this management the rhubarb is rendered ſo firm and ſolid as we find it; for, if it were hung up to dry at once in a warm airy place, it would become light and ſpongy; likewiſe if the roots were to be taken up in ſummer, they would be light and of little value, and would not have the reddiſh marbling: which is one of the greateſt characters of its goodneſs.

The rhubarb plants, are now growing in the public gardens of Paris and Chelſea, where it thrives extremely well; and I have not the leaſt doubt, but it will do the ſame here, and be a very profitable crop.

TURMERIC.

Turmeric is a ſmall root of an oblong figure, uſually met with in pieces from half an inch

inch to two inches in length, and at the utmoſt ſurface the thickneſs of a man's little finger; its ſurface is uneven, and riſes into knobs in many places, and the longer pieces are ſeldom very ſtraight; it is very heavy and hard to break; it is not eaſily cut through with a knife; but when cut, leaves a gloſſy ſurface.

Its colour, externally, is a pale whitiſh grey, with ſome faint tinge, of yellowneſs, and when broken, is of a fine yellow within; this colour is bright and pale, and without admixture when the root is freſh; but in keeping, it by degrees becomes reddiſh, and at length is much like ſaffron in the cake. Thrown into water, it ſpeedily gives it a fine yellow tinge; and, chewed in the mouth, it gives the ſpittle the ſame colour. It is eaſily powdered in the mortar, and, according to its different age, makes a yellow, an orange colour, or a reddiſh powder. It has a kind of aromatic ſmell, with ſomething of the odor of ginger in it—The taſte is acrid and diſagreeable, and has a conſiderable bitterneſs.

The plant which produces it, is of the number of the monandria monogynia, according to the Lynnæn ſyſtem, and of the herbœ bulboſis affines of Mr. Ray. It is deſcribed in the Hortus

Hortus malabaricus, under the name of the manjalla kua, and by Herman under that of kuba.

The leaves are a ſpan long, and three or four inches broad, of a fine green colour, and pointed at the end. The flowers grow on a peculiar ſtalk of eight, ten, or more inches high, and of the thickneſs of a gooſe quill; They are collected in a kind of ſquamous cone, and of an oblong figure, reſembling thoſe of the cannacorus, but vaſtly ſmaller, and are of a pale rediſh colour; theſe are ſucceeded by tricapſular ſeed veſſels, containing a quantity of ſmall roundiſh ſeed, from which it may be propagated, or by the roots which are perennial; if from the ſeeds, it is two years before it comes to perfection.

The ſeed muſt be ſown early in the ſpring, and the plants produced from the ſeed, are to be planted out in the fall, in rows from ſix to nine inches diſtance; with ſufficient room between the rows, for the hoe-plow.

The roots are to be dug up for uſe, ſoon after the flowers are fallen, and dried in the ſun.

It is a native of the Eaſt-Indies, and requires high, dry, warm land. It is generally imported from Java and Malabar, and in many other parts they cultivate it, where they uſe a great deal of it in their ſauces and food.

It is of great ſervice in dying, andin many other arts. The glovers uſe it to colour their leather, and the turners to give an agreeable yellow to ſeveral of their works made in the whiter woods.

SAFFRON.

Saffron, is made from the flower of the crocos. It is not the entire flower of the plant that produces it, but only ſome of its internal parts. It is met with in the ſhops in flat and thin cakes; into which it has been formed by preſſing, and which conſiſt of many long and narrow filaments, that are ſmaller in their lower part, where they are of a pale yellow colour; in their upper part they are broader and indented at their edges, and of a very ſtrong deep orange colour approaching to redneſs. They are ſomewhat tough, moderately heavy, very eaſily cut, of an acrid penetrating

penetrating, but not an unpleaſant ſmell, ſomewhat affecting the head, and of a bitteriſh, and hot, but highly cordial taſte. Thrown into water, they almoſt inſtantaneouſly give it a ſtrong yellow or reddiſh colour, according to the quantity uſed. Theſe filaments are the criſtated capillaments, into which the piſtol of the flower divides at its head: they are of a deep reddiſh orange colour, while growing, and there are only three of them in each flower.

The crocus, or plant which produces it, is one of the triandria monogynia of Lynnæus, and one of the herbæ bulboſa radice præditæ of Mr. Ray. The beſt way of propagating is by the bulbs, of which it annually produces new ones. Theſe are to be planted out in trenches at four inches diſtance, and they ſeldom fail. They only produce leaves the firſt year; but in September, or October of the year following, they flower.

The ſaffron is gathered as ſoon as the flowers open; but the beſt crop, is always from the old bulbs; of which the largeſt, plumpeſt, and fatteſt roots, are to be choſen, throwing by the longeſt pointed ones, which are called ſpickets, or ſpickards: for the round flat

flat roots, always produces the beſt flow ers.

The land where it is intended to be cultivated, ſhould be in an open, level country, the ſoil not poor, nor a very ſtiff clay, but a temperate dry mould, of a hazle colour, or of a loamy nature. The ground being made choice of, about the latter end of March, or beginning of April (according to the ſeaſon) it muſt be carefully plowed, the furrows being drawn much cloſer together, and deeper, if the ſoil will allow it, than is done for any ſort of grain.——About five weeeks after, or during any time in the month of May, lay between twenty and thirty loads of ſhort rotten dung, or manure from the compoſt heap upon each acre; and having ſpread it with great care, plow it in as before. About midſummer, plow a third time, and between every ſixteen feet and half, or pole in breadth, leave a broad furrow or trench, which ſerves both as a boundary to the ſeveral parcels, and to throw the weeds in at the proper ſeaſon.

The next general part of the culture of ſafron, is planting or ſetting the roots: the beſt inſtrument to be uſed for which is a narrow ſpade, commonly termed a ſpit-ſhovel. The time

time for planting is in July, a little ſooner or later, according as the weather anſwers. The method is this: one man with his ſpit-ſhovel raiſes between three or four inches of earth, and throws it before him, about ſix or more inches: two perſons, (women or boys will do) following with heads, place them in the fartheſt edge of the trench he makes, at four inches diſtance from each other, or thereabouts. As ſoon as the digger or ſpitter has gone once the breadth of the ridge, he is to begin again at the other ſide, and digging, as before, covers the root laſt ſet, and makes the ſame room for the ſetters to place a new row, at the ſame diſtance from the firſt, as they are from one another. Thus they are to go on till a whole ridge is planted; and the only nicety, in digging is, to leave ſome part of the firſt ſtratum of earth untouched, to lie under the roots, and, in ſetting, to place the roots directly upon their bottom. There ſhould be ſome regard had to the ſize of the roots, placing the largeſt at a greater diſtance than the ſmaller ones.

Theſe roots are to continue in the ground three years; the firſt year the crop will be the leaſt. About the midſummer after the third crop is gathered, the roots muſt all be taken

taken up, and tranſplanted into freſh ground, prepared as before mentioned.

The moſt expeditious method is to plow them up with a ſmall plow that has a narrow earth-board: and people to follow and gather the heads as they are turned up. They are next to be carried to the houſe in ſacks, and there cleaned: this labour conſiſts in cleaning the roots thoroughly from earth, ſeparating the young ſuckers or bulbs from the old ones, and from the remains of old roots, old involucra and excreſcences; and thus they become fit to be planted in new ground immediately, or to be kept for ſome time without danger of ſpoiling. One acre when broke up, will have a ſufficient quantity of roots to plant four. The young roots or bulbs muſt be planted by themſelves.

The quantity of roots to be planted on an acre is generally about 128 buſhels, which according to the diſtances left between them, as before aſſigned, and ſuppoſing all to be an inch in diameter one with another, ought to amount to 392,040 in number.

From the time that the roots are planted, till about the beginning of September, there is no more labour about them; but as they then

then begin to ſpire, and are ready to ſhow themſelves above ground (which is known by digging a few out of the earth) the ground muſt be carefully pared with a ſharp hoe. The running hoe before deſcribed, will be beſt, and the weeds, &c. raked into the furrows, otherwiſe they would hinder the growth of the plants. In ſometime after, the ſaffron flowers will appear, which are gathered as well before as after they are full blown, and the moſt proper time for this is early in the morning, when the whole flowers are to be gathered, and thrown handful by handful into a baſket; having then carried home all you have got, immediately ſpread them upon a large table, and fall to picking out the filamenta ſtylis, or chives and together with them a pretty long proportion of the ſtylus itſelf, or ſtring to which they are joined; the reſt of the flower may be thrown away as uſeleſs. The next morning return into the field again, whether it be wet or dry weather, and ſo on daily, till the whole crop be gathered.

The chives being all picked out of the flowers, the next labour about them is to dry them on the kiln. The kiln may be built on a thick plank (that it may be removed from place to place) ſupported by four ſhort legs, the outſide of eight pieces of wood, about three

inches thick, in form of a quadrangular frame: about twelve inches ſquare at the bottom, on the inſide, and twenty inches a top; which is likewiſe equal to the perpendicular height of it. On the foreſide muſt be a hole about eight ſquare, and four inches above the plank, through which the fire is to be put in. Over all the reſt lay laths pretty thick, cloſe to one another and nailed to the frame already mentioned; and then muſt be plaiſtered over on both ſides, as alſo the planks at bottom very thick to ſerve for an hearth. Over the mouth or wideſt part, put an hair-cloth, network, or iron wire, fixed to the ſides of the kiln; and likewiſe to two rollers, or moveable pieces of wood, which muſt be turned by wedges or ſcrews, in order to ſtretch them.

The kiln is to be placed in a light part of the houſe; and you are to begin by laying five or ſix ſheets of white paper on the hair cloth or net work, &c. upon which you muſt ſpread the wet ſaffron, betweeen two and three inches thick; this is to be covered with other ſheets of paper, and over theſe lay a coarſe blanket five or ſix times doubled; or inſtead thereof a canvas pillow filled with ſtraw; and, after the fire has been lighted

for

for ſome time, the whole is covered with a board, having a large weight on it.

At firſt you muſt give it a pretty ſtrong heat, to make the chives ſweat, but muſt be careful you do not ſcorch them, for that will ſpoil all that is in the kiln. When it has been thus dried about an hour, take off the board, blanket and upper papers, and take the ſaffron off from that which lies next it; raiſing at the ſame time, the edges of the cake with a knife; then, laying on the paper again, ſlide in another board between the hair cloth, &c. and under papers, and turn both papers and ſaffron upſide down; afterwards covering them, as above.

The ſame heat is to be continued for an hour longer; then look at the cake again, free it from the paper, and turn it; then cover it, and lay on the weight as before. If nothing happens amiſs, during theſe two firſt hours, the danger will be over, for there is nothing more to do, but to keep a gentle fire, and to turn the cakes every half hour, till thoroughly dry; for the doing of which as it ought, there are required full twenty four hours.

The

The fire may be made of any kind of fuel, but that which ſmokes the leaſt is beſt; and charcoal, for that reaſon, is preferred to any other.

In England, ſaffron is cultivated in large fields, and is no where raiſed with ſo much ſucceſs. Their crops frequently paying them ſixty pounds per acre. What is conſumed here comes chiefly from England. Which by the proper cultivation they give it, is allowed to be greatly ſuperior to any other. It is a root that will grow and thrive in any climate and almoſt any ſoil; why then, when the cultivation is properly known, may not a ſufficient quantity be raiſed here for our own conſumption, if not for exportation.

Theſe roots or bulbs are very cheap in England: how eaſily they might be imported by the ſpring ſhips; when they would arrive in proper time for cultivation.

IPECACUANHA.

There are two kinds of ipecacuanha, diſtinguiſhed by their colour, and brought from different places but both poſſeſſing the ſame virtues

virtues, though in a different degree; the one of theſe is grey, and is brought from Peru; the other is brown, and brought from the Braſils. The grey or Peruvian ipecacuanha, is a ſmall and irregular contorted and twiſted root; it is of the thickneſs of a ſmall gooſe-quill, and is brought here in pieces of one, two, three, or more inches in length; but theſe never ſtraight, but variouſly turned, and wreathed in ſeveral directions. It is of a rough ſurface, and that in a very particular manner, being raiſed into a ſort of annular ridges, at ſmall diſtances from each other, running quite round the root, and riſing conſiderable about the reſt of its ſurface. It is of a denſe and firm texture, conſiderable hard, though not tough, but breaking on attempting to bend it: it is moderately heavy, and does not cut eaſily through with a knife; it is of a duſky greyiſh colour, on the ſurface, and when broken, appears of a clearer and paler grey, and diſcovers a tough and firm nerve, occupying its centre, and always running its whole length; this nerve or fibre is very ſmall and ſlender, of a ſomewhat paler colour than the reſt, and is with much more difficulty reduced to powder; it is leſs reſinous, and of leſs virtue than the cortical part: the whole root is of a very peculiar ſmell, ſomewhat pungent, but not diſagree-

able in taſte: it is acrid, and ſomewhat bitteriſh, and upon the whole very diſagreeable.

The brown or Braſilian ipecacuanha, is a root much reſembling the former in all its characters, but it is, if any thing, more twiſted and convoluted: its annual ridges are higher raiſed than in that, and it is a ſmaller as well as ſhorter root; very few pieces of it much exceeding a crow-quill in thickneſs, or an inch and an half in length; it is of a deep duſky brown, or blackiſh, on the outſide, and white, when broken: it is leſs acrid, and has more of the bitter to the taſte than the grey kind, and has leſs ſmell.

Ipecacuanha, though one of the moſt valuable drugs the materia medica affords us, was not only unknown to the ancients, but even to the modern world, till the middle of laſt century. Piſo and Margrave were the firſt who brought it from South America to Europe; it was celebrated at that time as a cure for diſenteries, and got into uſe for a few years, but again ſunk into oblivion, and it was many years before it got into the reputation it now poſſeſſes.

The

The French were the firſt people in Europe who attempted to introduce it, and they ſucceeded very ill with it at firſt, which was owing to their giving it in too large doſes. Helvetius, was the man who firſt gave it ſucceſsfully among them, and the French king ſoon after purchaſed the ſecret of him at a large price, and communicated it to the world.

The plant which produces them is of the number of the herbœ bacciferæ or berry bearing plants of Mr. Ray Plukenet and Morriſon have called it a perclymenum, and Linnæus has named it ouragoga. It riſes to ſix, eight, or ten inches high, ſometimes to more than a foot; the ſtalks are tender and weak, and have no leaves except near the top, where there ſtand three or four, ſeldom more than five; and above theſe grow a few monapetalous flowers, divided into five ſegments at the edges, which are ſucceeded by as many roundiſh umbilicated berries, each containing three hard ſeeds. The root naturally extends to a great length, creeping horizontally under the ſurface of the ground; the ſtalk ſeldom ſtands erect, and the leaves are oblong, ſwelling in the middle, and ſmall at both ends; they are about two inches long, and an inch and an half nearly in breadth, ſometimes

ſometimes larger; they are rough to the touch, and ſomewhat paler on the under ſide than on the upper.

The method of propagating it, is from the ſeed, which muſt be ſown in a light rich earth, and when two years old, tranſplanted into rows at ſix inches apart, and four feet between the rows, to admit of the hoe plow to keep them clean from weeds.

The time for planting of them is in the fall of the year. And the ſecond fall after they are planted, as well as every ſucceeeding fall, they are to be dug between with a ſharp ſpade cutting off the horizontal roots, which are to be gathered up, cleaned and dried, which will be the true ipecacuanha ſold in the ſhops.

OPIUM.

Opium, in pharmacy is an inſpiſſated juice, partly of the reſinous, and partly of the gummy kind. It is brought to us in cakes or maſſes, uſually of a roundiſh figure, flatted and covered with poppy leaves. Theſe are of uncertain ſizes uſually about an inch thick, and

and their weight from eight ounces to a pound.

Opium is very heavy, of a denſe texture, not perfectly dry, but more or leſs ſoft, and, commonly, eaſily receiving an impreſſion from the finger; it is tough and hard to break, its colour a browniſh yellow, ſo very dark and duſky that in the maſs at firſt ſight it appears black, and of a faint, dead, unpleaſant ſmell, bitter to the taſte, and very acrid. It is inflammable, yet in great part ſoluble in water: it comes from Natolia, from Egypt, and from the Eaſt Indies.

The plant which affords opium is one of the polyandria monogynia of Linnæus, and one of the herbæ flore tetrapetalo anomalo of Ray; and is deſcribed by all the botanical writers under the name of the white garden poppy, the papaver hortenſe ſemine albo, papaver ſativum dioſcoridis, and papaver album plinii.

The fields of Aſia Minor are in many places ſown with the white poppy as ours are with corn. When the heads grow towards maturity, but are yet ſoft, green, and full of juice, they make inciſſions in them with an inſtrument, which is a kind of a knife with five

five edges; this being ſtruck into the head, makes five long cuts in it, from which the opium flows, and is the next day ſcraped off with an edgeleſs knife, and is put up in a veſſel, faſtened to the girdle for that purpoſe; at the time the opium is collected, the oppoſite ſide of the poppy head is wounded by the ſame inſtrument uſed at firſt, and the opium is collected next day in the ſame manner.

They diſtinguiſh the produce of the firſt wounds from thoſe of the ſecond, and with great reaſon, the firſt being greatly ſuperior to the ſecond. They call the firſt flowing of the heads gobaar; it has much more virtue than the reſt, and is ſold at a much greater price: Its colour is at firſt white, but afterwards yellowiſh; and when long kept, of a duſky brown. The opium produced from the ſecond wounds is darker coloured, and approaches to blackneſs; it has a weaker ſmell and taſte than the former; after this they make a third, by bruiſing their heads and expreſſing their juice; but this laſt is reckoned but of little value.

After they have collected the opium, they moiſten it with a ſmall quantity of water, or of honey, and work it a long time upon a flat

flat, hard ſmooth board, with a thick and ſtrong inſtrument of the ſame wood, till it becomes of the conſiſtence of pitch: Finally, they work it up with their hands, and form it into cakes, or rolls, for ſale.

Opium being now ſo generally uſed in medicine, muſt cauſe a great demand for it: Of courſe it muſt fetch a good price, therefore it will be an object worthy the agriculturiſt's attention.

The poppy is propagated from the ſeed; one hundred heads will produce ſeed enough to ſow an acre; the cultivation of it is exceedingly eaſy, as it will grow in almoſt any ſoil or climate; and I am of opinion if the heads were collected together when they are full of juice, (juſt before they come into flower) and the juice preſſed out and managed as before deſcribed, that the opium would be as good as that collected from the inciſions, as it would contain the ſame virtues.

This method will ſave a great deal of trouble and expence.

Prepared opium or laudanum, is a tincture of opium made by diſſolving the opium in

in ſpirits of wine, ſome other ſpirits, or water having different ingedients added to it, according to the uſe it is intended for.

FINIS.

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