THE

COMPLETE GRAZIER;

or,

FARMER AND CATTLE-DEALER'S

ASSISTANT.

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THE COMPLETE GRAZIER;
OR, FARMER AND CATTLE-DEALER'S ASSISTANT.

COMPRISING
Instructions for the buying, breeding, rearing, and fattening of Cattle.
Directions for the Choice of the best Breeds of Live Stock.
The Treatment of their Diseases, and the Management of Cows and Ewes, during the critical Times of Calving and Yeasting.
The general Economy of a Grass-farm, especially

Irrigation, or Watering of Meadows;
Culture of the best natural and artificial Grasses and Plants for Fodder;
Various Methods of cutting, mixing, and preparing Food in severe Winters, and Seasons of Scarcity;
The Economy and general Management of the Dairy, including the making, curing, and preservation of Butter and Cheese, &c. &c.

TOGETHER WITH A
SYNOPTICAL TABLE
OF THE DIFFERENT BREEDS OF
NEAT CATTLE, SHEEP, AND SWINE.

ILLUSTRATED BY ENGRAVINGS.

BY A LINCOLNSHIRE GRAZIER,
Assisted by Communications from several Yorkshire, Leicester, & Norfolk Farmers.

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1805.
TO

THE SOCIETY

for the

Encouragement of Arts, Manufactures, and Commerce;

Whose Exertions

have,

for upwards of half a Century,

been unremittingly devoted

to the Promotion

of

T H E I R C O U N T R Y ' S B E S T I N T E R E S T S :

The present Work

is inscribed,

as a sincere tribute of Gratitude,

for the

P L E A S U R E , P R O F I T , A N D I N S T R U C T I O N ,

derived from the

A T T E N T I V E S T U D Y O F T H E I R " T R A N S A C T I O N S , "

by

Their obliged Servant,

T H E E D I T O R.
P R E F A C E.

Among the various publications which, of late years, have issued from the press, on different subjects of rural economy, none has hitherto appeared on that department which is here more particularly the object of discussion. With a view to supply such deficiency, the present work was undertaken; in which it is attempted to concentrate every important fact connected with the rearing, breeding, feeding, fattening, and diseases of cattle, (so far, at least, as the present imperfect state of veterinary medicine will allow), as well as on the general economy of a grass-farm. Such as it is, the editor now submits the result of his labours—founded partly on personal knowledge, and, where that was deficient, on the experience of others—to the candour of a British public; conscious that, though it be not faultless (and
perfection is not the lot of man), he has sedulously avoided the introduction of speculative opinions, or of undue assertions, while no efforts have been omitted to render the present work a useful compendium of facts, connected with the peculiar branch of rural economy which is therein discussed.
**A TABLE OF THE BREEDS OF NEAT CATTLE, SHEEP, AND SWINE.**

**A SYNOPSIS**

**DIFFERENT BREDS OF NEAT CATTLE IN GREAT BRITAIN.**

**TABLE I. CONTINUED. SHEEP WITHOUT HORN.**

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**TABLE OF THE PRINCIPAL BREEDS OF SWINE IN GREAT BRITAIN.**

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**THE BREEDS OF SWINE**

- **Bos primigenius**
- **Bos taurus**
- **Bos indicus**
- **Bos grunniens**
- **Bos aurochs**
- **Bos javanicus**

**ANTECEDENTS OF THE DIFFERENT BREDS.**

- **Bos primigenius**
- **Bos taurus**
- **Bos indicus**
- **Bos grunniens**
- **Bos aurochs**
- **Bos javanicus**

**CLASS II. AGRO-INDUSTRIAL STOCK.**

**A TABLE OF THE BREEDS OF SWINE.**

**A TABLE OF THE BREEDS OF SHEEP.**

**A TABLE OF THE BREEDS OF CATTLE.**

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**A TABLE OF THE BREEDS OF CATTLE.**
Of the various sources which compose the wealth of nations, there are few, perhaps, of greater moment, or which have a superior claim to attention, than that branch of rural economy which is the subject of the following pages. In fact, when it is considered, that not only the servants of a farmer, but also his cattle, are productive labourers; when we recollect the stimulus to industry, as well as the rapid circulation of capital which the farmer occasions, by furnishing constant employment to the numerous artificers, who are occupied in manufacturing implements which are indispensably necessary to him; farther, when we call to mind the immense mass of materials which his productive labour supplies for the purposes of commercial intercourse, and especially the influence produced by that labour on the comfort and appearance of towns, whose inhabitants must otherwise be destitute of the necessaries of life; when all these diversified circumstances are taken into consideration, every reflecting enquirer must acknowledge, that of all the ways in which a capital can be employed, this is by far the most advantageous to society.
Justly, therefore, has it been remarked*, that "the capital employed in agriculture not only puts into motion a greater quantity of productive labour than any equal capital employed in manufactures, but, also in proportion to the quantity of productive labour which it employs, it adds a much greater value to the annual produce of the land and labour of the country, while it increases the real wealth and revenue of its inhabitants."

SECTION I.

†Farmer's Calendar, Ed. of 1804, p. 481.
tle; whether for the pail, or with the view of supplying the markets. In fact, it will be expedient to observe the greatest exactness in this proportion, because, in case he should overstock his land, his loss will be certain and great; while, on the other hand, he will incur a diminution in his profit, if he should not stock his land with as many cattle as it will bear.

Formerly, a great prejudice prevailed in favour of big-boned, large beasts, but it has been ascertained, that this breed is, in point of profit, much inferior to the middle-sized kind; and, by a careful attention to the selection of stock, no inconsiderable progress may be made towards the improvement of the different species. Among the various professional breeders of modern times, few have attained greater celebrity than the late Mr. Bakewell, of Dishley, to whom we are indebted for many new and important improvements in the science of rearing cattle. The principle which he invariably adopted was, to select the best beast, that would weigh most in the valuable joints; so that, while he gained in point of shape, he also acquired a more hardy breed; and, especially by attending to the kindliness of their skin, he became possessed of a race which was more easily fed and fattened than any other.

Till within a few years, the invariable practice was to judge by the eye only, without regarding the other qualities of the animal intended to be purchased; but, in the present improved age, a more rational mode of forming the judgment is adopted. The sense of touch is now brought in aid of the sight; and, by repeated practice, the art of judging of the kindliness to fatten has been brought to such perfection, that any well-informed breeder, who has personal experience, can, on examining lean beasts, tell, almost instantaneously, in what points or parts they will or will not fatten.

In the selection, therefore, of live stock in general, the
young farmer will find it necessary attentively to consider the following particulars:

I. Beauty; or symmetry of shape; in which the form is so compact, that every part of the animal bears an exact consistency, while the carcase should be deep and broad, and the less valuable parts (such as the head, bones, &c.) ought to be as small as possible*. In these points all intelligent breeders concur; but, as beauty of shape too often depends on the caprice of fashion, it is more requisite to regard

II. Utility of form, or that nice proportion of the parts to which Mr. Bakewell bestowed so much attention, and which has already been noticed.

III. The flesh, or texture of the muscular parts; a quality, which was formerly noticed only by butchers, but the knowledge of which the enlightened farmers or breeders of the present day have not blushed to acquire from them; although this quality necessarily varies according to the age and size of cattle, yet it may be greatly regulated by attention to the food employed for fattening them. As a knowledge of this requisite can only be acquired by practice, it is sufficient to state, that the best sign of good flesh is that of being marbled, or having the fat and lean finely veined, or intermixed, when the animals are killed; and, while alive, by a firm and mellow feel.

IV. In rearing live stock of any description, it should be an invariable rule to breed from small-boned, straight-backed, healthy, clean, kindly-skinned†, and round-bodied


† As this word may probably often appear in the course of the subsequent pages, it may not be altogether irrelevant to state, that it implies a skin which feels mellow, i.e. soft, yet firm to the touch, and which is equally distant from the hard, dry skin, peculiar to some cattle; as it is from the loose and flabby feel of others.
animals, carefully rejecting all those which may have heavy legs and roach backs, together with much appearance of offal. And, as some breeds have a tendency to generate great quantities of fat on certain parts of the body; while in others it is more mixed with the flesh of every part of the animal, this circumstance will claim the attention of the breeder as he advances in business.

V. In the purchasing of cattle, whether in a lean or fat state, the farmer should on no account buy beasts out of richer or better grounds than those into which he intends to turn them; for, in this case, he must inevitably sustain a very material loss, by the cattle not thriving, particularly if they be old. It will, therefore, be advisable to select them, either from stock feeding in the neighbourhood, or from such breeds as are best adapted to the nature and situation of the soil.

VI. *Docility of disposition*, without being deficient in spirit, is of equal moment; for, independently of the damage committed by cattle of wild tempers on fences, fields, &c. which inconvenience will thus be obviated; it is an indisputable fact, that *tame beasts require less food to rear, support, and fatten them*, consequently every attention ought to be paid, early to accustom them to be docile and familiar.

VII. *Hardiness of constitution*, particularly in bleak and exposed districts, is indeed a most important requisite; and, in every case, it is highly essential to a farmer’s interest to have a breed that is liable neither to disease nor to any hereditary distemper. A dark colour, and in cattle which are kept out all the winter, a rough *pile* or coat of hair are, in the popular estimation, certain indications of hardiness; but it is obvious to every thinking person, that this quality, though in some respects inherent in particular breeds, depends, in a great measure, upon the method in which cattle are treated.
VIII. Connected with hardiness of constitution is early maturity, which, however, can only be attained by feeding cattle in such a manner as to keep them constantly in a growing state. By an observance of this principle, it has been found that beasts and sheep, thus managed, thrive more in three years, than they usually do in five, when they have not sufficient food during the winter, by which, in the common mode of rearing, their growth is checked.

IX. A kindly disposition to take fat on the most valuable parts of the carcase, and with little food, when compared with the quantity and quality consumed in less fertile situations.

X. The hide of cattle is also worthy of notice; as, by the simple touch, both butchers and graziers are enabled to judge of their disposition to fatten. Sir John Sinclair has justly remarked*, that, "when the hide or skin feels soft and silky, it strongly indicates a tendency in the animal to take on meat; and it is evident, that a fine and soft skin must be more pliable, and more easily stretched out to receive any extraordinary quantity of flesh than a thick or tough one. At the same time, thick hides are of great importance in various manufactures. Indeed, they are necessary in cold countries, where cattle are much exposed to the inclemency of the seasons; and, in the best breeds of Highland cattle, the skin is thick, in proportion to their size, without being so tough as to be prejudicial to their capacity of fattening."

XI. Working, or an aptitude for labour; a point of infinite importance in a country, whose population is so extensive as that of Britain, and where the consumption of grain by horses has so material an influence on the comforts and existence of the inhabitants. As, however, there is a difference of opinion on this subject, the reader is referred to

* "Hints regarding Cattle," p. 157, &c.
the fifth section of this chapter, where the question is fully discussed.

XII. Whether kine be purchased for the plough, or for the purpose of fattening, in addition to the essentials already stated, it will be necessary to see that they are young, in perfect health, full-mouthed, and not broken either in tail, hair, or pizzle; that the hair stare not, and that they are not hide-bound, otherwise they will not feed kindly. The same remark is applicable to cows intended for the pail, the horns of which should be fair and smooth, the forehead broad and smooth, udders white, yet not fleshy, but large and lank, and provided with four teats.

XIII. Age.—Beside the rules above stated, there are some particulars with regard to the age of neat, or black, cattle and sheep, (for that of horses will be noticed in the Appendix,) which will merit the farmer's consideration.

"Sheep, in general, renew their first two teeth from fourteen to sixteen months old, and afterwards every year, about the same time, until they are turned three years old, or rather three shear, to speak technically, when they become full mouthed; for, though they have eight teeth in the under jaw before, I believe they only cast or renew the six inside ones." But with regard to this point, there is a difference of opinion among experienced shepherds, some of whom conceive that they cast only six, while others think they renew the whole eight fore-teeth.

"Neat cattle cast no teeth until turned two years old, when they get two new teeth; at three they get two more; and in every succeeding year get two; until five years old, when they are called full-mouthed, though they are not properly full-mouthed until six years old, because the two

* For these hints we are indebted to Mr. Culley's interesting "Observations on Live Stock," 8vo. 1801, p. 211.
corner teeth, which are last in renewing, are not perfectly up until they are six*.

The horns of neat cattle also supply another criterion by which the judgment may be assisted, after the signs afforded by the teeth become uncertain. When three years old, their horns are smooth and handsome; after which period there appears a circle, or wrinkle, which is annually increased as long as the horn remains; so that, according to the number of these circles or rings, the age of a beast may be ascertained with tolerable precision, unless such wrinkles are defaced, or artificially removed, by scraping or filing, a fraudulent practice, which is but too frequently adopted, in order to deceive the ignorant or inexperienced purchaser with respect to the real age of the animal.

SECTION II.

Sketch of the Natural History of the Bull, together with a Comparative View of the different Breeds of Black Cattle.

In the preceding section, some general remarks on the purchasing of cattle have been given, and a few characteristic features have been pointed out, in order to assist the young adventurer in this branch of rural economy. But, as the male of every species is the principal in the breed and generation, we trust it will not be useless to give an account of that form or shape which is so essential to the constituting of a perfect animal.

A bull, then, ought to be the most handsome of his kind; he should be tall and well made; his head should be rather long; and, as it is designed by nature to be the chief instrument both of offence and of defence, it ought to present every mark of strength; his horns rather long,

* Culley on Live Stock, p. 208, 209.
clean, and bright; his large black eyes lively and protuberant; his forehead broad and close set, with short, curled hair; his ears long and thin, hairy within and without; muzzle fine; nostrils wide and open; neck strong and muscular, not incumbered with a coarse, wreathy skin, but firm, rising with a gentle curve from the shoulders, tapering to the part where it is connected with the head; and dewlap large, thin, and hairy. Farther, his shoulders should be deep, high, and moderately broad at the top; the bosom open; breast large, and projecting well before his legs; back straight and broad, even to the setting on of the tail, which should not extend far up the roof, but be strong and deep, with much lank hair on the under part of it; ribs broad and circular, rising one above another, so that the last rib shall be rather the highest; the fore thighs strong and muscular, tapering gradually to the knees; the belly deep, straight, and also tapering a little to the hind thighs, which should be large and square; the roof wide, particularly over the chine and hips, or hooks; the legs straight, short jointed, full of sinews, clean, and fine boned; knees round, big, and straight; feet distant one from another, not broad, nor turning in, but easily spreading; hoofs long and hollow; the hide not hard, or stubborn to the touch; the hair uniformly thick, short, and of a soft texture; and the body long, deep, and round, filling well up to the shoulder and into the groin, so as to form what what has not improperly been termed a round, or barrel-like carcase.

The bull attains the age of puberty generally at the end of from twelve months to two years; but it is advisable to restrain him from the propagation of his species until he has arrived at his full growth, which is about four years; for if this animal be suffered to breed earlier than three years, the stock is liable to degenerate. Nor ought more than twenty cows to be allotted to one bull, or this
animal be permitted to serve more than two cows in one day.

The bull, as well as the cow and ox, generally lives about fourteen years; but the progress of decay is usually perceptible after he has attained the age of ten years. His temper is naturally fierce and ungovernable, which is not a little increased by his being permitted to live quietly in the best pastures, without being applied to any useful purpose but that of propagating his species. Hence this animal, naturally vicious, often becomes so mischievous as to endanger many valuable lives, an evil which, we conceive, might be remedied by training him to labour. For, being the only beast of his size which is thus indulged in idleness, and as he possesses equal strength with the ox, we doubt not but if he were moderately worked, and allowed to indulge his desires during the breeding season, he would, by being inured to labour and attended by mankind, become gradually tame, and harmless as the horse, or any other often naturally vicious animal. We understand indeed, that several experiments have been made for this purpose; and, from their successful result, we think the practice of working bulls may be advantageously adopted; especially as these animals are not only broken in with little difficulty, and work well, but also because they recover from fatigue much sooner than any ox, and may generally be procured at easy prices in those places where oxen being scarce, a young farmer cannot purchase without involving himself in great expence.

From the synopsis prefixed to this work, the reader will probably be enabled to form some estimate of the value of the respective breeds therein described; the two kinds, however, which are chiefly reared, are the long-horned and the short-horned cattle; and, concerning their merits and demerits, there has long been a difference of opinion among the most experienced breeders. It may not, therefore, be
altogether useless to offer a few comparative remarks to the consideration of the young grazier. "The long horns excel in the thickness and firm texture of the hides, in the length and closeness of the hair, in their beef being finer grained and more mixed and marbled than that of the short horns, in weighing more in proportion to their size, and in giving richer milk; but they are inferior to the short horns, in giving a less quantity of milk, in weighing less upon the whole, in affording less tallow when killed, in being slower feeders, and of a coarser make, and more leathery, or bullish, in the under side of the neck. In few words, the long horns excel in the hide, hair, and quality of the beef; the short horns in the quantity of beef, tallow, and milk. Each breed," continues Mr. Culley, to whom we are indebted for these interesting observations, "have long had, and probably may have, their particular advocates; but, if I may hazard a conjecture, is it not probable, that both kinds may have their particular advantages in different situations? Why may not the thick, firm hides, and long, close-set hair of the one kind, be a protection and security against those impetuous winds and heavy rains to which the west coast of this island is so subject; while the more regular seasons and mild climate, upon the east coast, are more suitable to the constitutions of the short horns?"

It should, however, be understood, that the preference above given by Mr. C. to the long horned species, on account of the superior quality of their beef, applies only to the variety of that breed which was selected, improved, and recommended by the late eminent Mr. Bakewell, and which is described in the synopsis already referred to under the name of the Dishley breed. In fact, Mr. C. is of opinion that the beef of the short-horned race is in general superior to that of the common long-horned sort in general; though he has little doubt but "a breed of short-horned cattle

* Culley on Live Stock, p. 20.
might be selected, equal, if not superior, even to that very kindly-fleshed sort of Mr. Bakewell's, provided any able breeder, or body of breeders, would pay as much attention to these as Mr. Bakewell and his neighbours have done to the short horns.

That consideration, which this important subject requires, has of late years been amply bestowed upon the improvement of British cattle; and beside the respectable breeder abovementioned, the labours of the late and present Duke of Bedford, the late Mr. Fowler, of the various excellent societies established in many parts of Britain for this public-spirited purpose,—to omit the numerous private individuals who have recently applied themselves to this branch of rural-science,—all these must claim the gratitude and good wishes of every real friend to his country.

But, though the short and long-horned cattle have hitherto almost exclusively occupied the attention of breeders,

* Culley on Live Stock, p. 81.

† Of Little-Rollright, in the county of Oxford, whose stock was sold by auction, in the month of March 1791. Few exhibitions could be more enchanting than the picturesque view presented by these beautiful animals, at the sale of which the most respectable farmers were present, many of whom had travelled several hundred miles, from almost every part of Britain; and the prices given for which are almost incredible. Let it suffice to say, that fifteen prime head of cattle, five bulls and ten cows, were sold for various sums, amounting to £246 4s.; or, upon an average, at £164 each. The finest bull, named Sultan, only two years old, produced two hundred and ten guineas; Washington, another of the same age, was sold for two hundred and five guineas; while Brindled Beauty, a cow, brought the sum of two hundred and sixty guineas; and, at a subsequent sale of Mr. Paget's stock, in November 1793, Shakespeare, a bull bred by Mr. Fowler, was disposed of for the enormous sum of four hundred guineas!—So great, indeed, was Mr. F's deserved reputation, that the Great Frederic, king of Prussia, conferred on him a gold medal, and honoured him with his correspondence.
it is evident, that there are other varieties, or species, which might be introduced with greater advantage in many situations. Such, for instance, are the Highland breed, or Kyloes, and its variety, the Isle of Sky cattle, which are singularly well adapted to cold, exposed, and healthy, mountainous parts; such also are the Galloway, and its variety, the Suffolk duns. These beasts have acquired great reputation at Smithfield market for the excellence of their marbled flesh, a quality which is materially increased by their quick feeding, and kindliness to fatten.

It has already been hinted, when discussing the subject of buying cattle, that it will be advisable to select them, either from stock feeding in the neighbourhood, or from those sorts which are best calculated for the nature and situation of the soil. This remark should be constantly kept in view, with regard to the breeding of cattle; let, therefore, that breed which is most profitable and best suited to the situation of the farm first be ascertained; and, having succeeded in this desirable object, let it be the breeder's study to improve that sort to the utmost, by selecting and breeding from those, which to beauty of form unite the more essential qualities of possessing kindly skins, and of weighing most in the valuable parts, together with a disposition to lay fat on the best points, as well as to fatten in a short period of time.

Before we conclude this subject, it may not be amiss to notice the neat cattle reared in the sister island. Few countries are, perhaps, so well situated for the breeding of cattle of every description; and it is in consequence of this peculiar felicity of situation, that our fleets are supplied with the immense quantities of prime beef necessary for the support of their crews.

The breed of Irish cattle, of which many thousand carcases are annually exported, is distinguished by little variety, excepting that which necessarily arises from the
difference of situation. They are remarkable for the strength of their constitution; and appear to be a mixed race, between the long-horned breed and the Scotch or Welch cattle. The counties of Roscommon, Limerick, Cork, and Tipperary are chiefly celebrated for the vast herds of cattle which are there annually bred and slaughtered for exportation; and many of the most public-spirited breeders have, of late years, incurred very considerable expense by purchasing prime, long-horned stock from England, for the purpose of improving their breeds; a measure that has already been attended with the most beneficial effects, and which will doubtless, in the course of a few years, prove a source of great wealth to that island.

SECTION III.

Of the Cow.

The value of the respective breeds of milch kine having been stated in the synopsis already alluded to, it will rest with the farmer to make his selection according to the nature of the soil, and to choose such cows as are nearly of the same colour, and of the same country as the bull.

A perfect cow ought to have a broad, smooth forehead; black eyes; large, clean horns; a long, thin skin; a large, deep body; strong, muscular thighs; a large, white udder with four teats, together with every other token requisite in a bull, allowing for the difference of sex. Farther, such animal ought particularly to be young; for milch kine are not good for breeding after they are twelve years old, though they will often live a much longer time if their pasture be good, and they be kept from diseases.

Cows are purchased, either with the view of being fattened for sale, or for the purposes of the dairy: in the former case, it will be advisable to attend to the kindliness of
their skins, and dispositions to fatten; but, with regard to those which are intended for breeding, care should be taken to select those which yield abundance of milk. In fact, those beasts which yield great quantities of milk, never feed quickly; and it is from repeated unsuccessful efforts to unite these two irreconcilable properties, that the different breeds of neat cattle have hitherto been brought to so little perfection. There is, it is true, a middling kind of cows, which give a tolerable quantity of milk, and also keep in pretty good condition; but, though many of this sort will become very fat when they are dried, or their milk taken from them, yet they will not fatten so speedily or so well as those which yield a less portion of milk, and which are more kindly disposed to fatten while they are in a milking state*.

It is a general observation among farmers, that the richest milk is produced by the red cow, while the black sort is reckoned best for the purpose of breeding, as her calf is usually both stronger and more healthy than the offspring of the red species. This, however, is one of those errors which have been transmitted, through a long series of years, without being founded on fact. The red cows have, indeed, been long celebrated for the excellency of their milk; and the calves of black cows have been proverbially deemed good; but colour in this respect is a matter of no moment; the breed alone should claim the farmer’s attention.

As, however, the dairy constitutes, in many parts of the kingdom, an object of great importance, it is a point worthy of the most deliberate discussion, whether a particular breed ought to be kept for that purpose only, or whether it be preferable to have stock calculated partly for the butcher, and partly for the dairy. “It is probable,” observes Sir Culley on Live Stock, p. 89.
Sir John Sinclair*, "that, by great attention, a breed might be reared, the males of which might be well calculated, in every respect, for the shambles; and the females of which might, when young, produce abundant quantities of good milk; yet, when they reached eight or nine years of age, might be easily fattened. This," he justly remarks, "would be the most valuable breed that could be propagated in any country; and, indeed, some of the best English and Scottish breeds have almost reached that point of perfection."

The cow is supposed, by some eminent naturalists, to arrive at puberty at the end of eighteen months, though instances have occurred where these animals have produced calves before that time. It is, indeed, said by some breeders, in the northern part of this island, that young cows may be sent to the bull as early as even one year old, a practice which would certainly be an essential improvement where the dairy constitutes a primary object, provided their growth would not thus become stinted, which inconvenience might probably be obviated by good feeding. It is, therefore, advisable not to permit cows to take the bull earlier than two years, though the majority of breeders defer it another year; and in conformity to the latter opinion, the late eminent Mr. Bakewell deferred sending his cows to bull till they were three years old; but his cows often missed calf, which accident Sir John Sinclair† attributes to this circumstance. In case, however, a cow produces a calf before she enters upon her third year, the animal should be removed from her; and it will be proper to milk her for the three following days, to prevent the udder from becoming sore, but afterwards to forbear milking.

The most advantageous time, in general, for a cow to

* In a most interesting communication of "Hints regarding Cattle," inserted in the "Farmer's Magazine," vol. iii, page 156.
† Ibid. p. 160.
take the bull is, from the commencement of May till the
middle or close of July, so that she may calf in January,
and thence forward till March or April. And as it is, in
most places, a matter of considerable importance to have
a uniform supply of milk throughout the year, we con-
ceive it would prove a source of profit to a farmer, pos-
sessing twelve or any larger number of milch kine, so to
arrange the circumstance of breeding as to have three or
more cows dry at one time.

In general, the cow conceives after once taking the
bull; but if she should chance to fail, she should go again to
bull within three weeks after. To prevent, however, this
accident, it will be advisable, as soon as convenient after
her return home, to throw a pail full of water on her udder
behind, and to keep her that night separate from any
others: for it not unfrequently happens that cows (after
taking the bull) will ride each other; in consequence of
which they not only misconceive, but also the quantity of
milk they yield is greatly diminished.

The desire of having a frequent supply of calves has
induced many to have recourse to artificial means, in order
to induce cows to take the bull; a measure which cannot
be sufficiently deprecated: for the most efficacious mode
of obtaining this object undoubtedly consists in keeping
them in good heart; in consequence of which nature will
predominate over the animal's body, and cause it to show
signs of procreation through the medium of the creature's
constitutional feelings.

The period of gestation, or time during which the
cow goes with calf, is about nine months, at the end of
which she produces one calf; though instances sometimes
occur when two, or even three, are brought forth. It may

* The drying up of the milk should be performed when the
cows are about five or six months gone with calf, or even later, ac-
cording to the strength of the animal's constitution.
not, however, be useless to remark, that some cows are naturally barren, which is said to be the case when a male and female calf are produced at the same time. The male animal is perfect in all respects; but the female which is denominated a free martin, is incapable of propagating her species; it does not vary very materially, in point of form or size, from other neat cattle, though its flesh is erroneously supposed to be greatly superior, with regard to flavour and fineness of the grain.

For about a month or six weeks before the time of calving arrives, it will be advisable to turn the cow into sweet grass, if in the spring; or, if it happen in the winter, she should be fed with the best hay, where that can be conveniently supplied; in which case she will yield a larger quantity of milk than if she had been provided with that food for a longer time, because the fatter a cow is the less milk is given; and yet, if it be too poor, there is danger lest she should fall in calving. Or she may be taken into the cow-house from the field, or straw-yard, and baited twice a day with green food, consisting of the hearts of cabbages, their decayed leaves being plucked off and given to lean cattle, turnips, potatoes, carrots, or other winter fodder, or with a mixture of bran and oat or bean meal, to which grains may sometimes be added, care being taken, in such case, to increase the quantity of meal.

The day and night after a cow has calved, she should be kept in the house, and be allowed tepid or lukewarm water only for her drink. On the day following, she may be turned out about noon, and be regularly taken in, during the night, for three or four successive days. The animals thus housed should be kept till the morning cold is dispersed, and a draught of warm water ought to be given previously to their being turned into the field, otherwise a premature exposure to the damp atmosphere cannot fail of greatly weakening them.
The hints above stated are given on the supposition that the cow is well, no difficulty having happened during the time of calving; and that she has not slipped, or cast her calf before its full time. It should be observed, that the proper position of a calf, while in the uterus, is with its fore-feet and head foremost, its back being towards the cow’s back, and its two fore-feet lying parallel to the sides of its head. Where the foetus appears in any other manner, it is termed an unnatural position; and the extraction of the calf, under these circumstances, requires the utmost steadiness and dexterity; as, however, no instructions can be adequate to every possible case, it will always be necessary, where this event is apprehended, immediately to apply to some expert cow-doctor, lest the loss of a valuable animal should be the consequence of such injudicious treatment. During this painful operation, particular attention should be given that the pudendum, or baron (as it is sometimes called) be not lacerated or torn: should this however take place, the part must be sewed gently up; and if it be swollen, it ought to be washed with lukewarm milk and water.

But, where a cow slips, or casts her calf prematurely, she must be tended with great care; and, whatever may be the cause, whether abusive treatment, violent exercise, bruises or blows, or that unnatural appetite known by the name of longing, every animal that has slipped her calf should be carefully separated from the rest of the herd. Cleanliness, which is an essential requisite in the general management of cattle, ought in this instance to be an object of special attention; and, as cows which are liable to drop their calves usually evince some preparatory symptoms between the cause of the abortion and the actual slipping of the foetus, it will not be altogether useless to bleed them two or three times, as this expedient has sometimes operated as a preventive.
After, however, the calf is produced, it will be necessary to assist the natural functions of the animal, in order to carry off the secundines*, provided in the uterus for nourishing the foetus; and which, continuing there, in consequence of abortion, would become putrescent, and thus occasion a disagreeable odour that would quickly communicate an infection among other breeding cows. For this purpose we would, at all times, recommend the following mixture to be given the cow, as soon after calving as possible:—Let about three quarts of water simmer over the fire; and, when warm, strew in as much oatmeal as will be sufficient to make a strong gruel, carefully stirring the whole, till it boils, that no lumps may arise; then add one quart of ale (or two of table beer) and one pound of treacle, and carefully incorporate the different ingredients by stirring. This mixture should be given lukewarm: it is peculiarly grateful to cows, which (particularly young ones) will drink it eagerly, after the first hornful, and are thus prevented from taking cold. And, as it is of importance to regulate the state of the body, this object may be effected by giving a mash of bran, wetted with warm water.

Further, it will be necessary to milk the cows, especially if they be full of flesh and the udder hard, three or four times a day, for two or three days, and the calf should be suffered to suck as frequently, if in the house; or, in the field, to run with her, and suck at pleasure; care being taken to observe that the mother does not prevent it; for, if the udder or teats be sore, she will naturally be averse to suckling, and danger is incurred of losing both animals: and, in case the kernel of the udder is hard, the hardness may be removed by rubbing it three or four times in the day.

* Or after-birth:—in the North it is termed the cleansing. This excrement ought to be narrowly watched, after it is passed, as cows will often eat it with great avidity.
With regard to the food proper for cows, particularly as it respects their milk, and also the fattening of them for sale, the reader is referred to Sect. I. and II. of Chap. III. Their diseases will form the subject of discussion in Chap. IV. Sect. II. and the proper time of milking them, together with the management of that nutritious fluid, will be treated infra, Chap. VIII. Sect. III,

SECTION IV.

Treatment and rearing of Calves.

On account of the great utility of the calf, whether intended for breed, labour, or feeding, the means of rearing and keeping this animal, have called forth all the ingenuity of the most expert breeders, from the earliest moment of its existence. Hence we shall state the various treatment bestowed upon calves in different counties, and endeavour to bring into one view every useful fact connected with this subject.

After the calf is produced, the cow uniformly shows an inclination to clean its skin, by licking off, with her tongue, the slimy matter adhering to the young animal. To facilitate this object, it is a frequent practice to throw a handful of common salt over the calf, or to rub a little brandy on it, in case she should disown it, which will cause the dam speedily to perform this necessary duty; and, about an hour after the birth, half a pint of the lukewarm gruel, or mixture, mentioned in the preceding section, may be given to the calf, (which prevents it from taking cold) in lieu of the beestings, or first milk drawn from the cow; which may be advantageously substituted for eggs in making puddings, or other culinary purposes. This mode of employing the beestings is certainly more rational than to give them to the children of cottagers, as is frequently
done, whose weak organs may be supposed incapable of digesting such a strong and viscid fluid. There are two modes of feeding calves:—one is, to permit them to run about with the parent cow the whole of the first year; the other mode is, to wean them when about a fortnight old, and bring them up by hand.

The former expedient is generally allowed to be productive of the best cattle, and is adopted in those counties where fodder is abundant and cheap. There is, however, one inconvenience attending this plan, viz. that the udder and teats of the cow are liable to be bruised by the young animal butting against them with its head while sucking. To prevent the injury that might thus happen, a singular practice is pursued in the district of Galloway, in Scotland, whence the London markets are supplied with the finest meat. From the time the calves are dropped till they are able to support themselves, they are allowed to run in the manner above mentioned; but they are prevented from sucking by means of a small piece of leather, having little sharp, iron spikes fixed upon the outside, which is tied on the upper part of the calf’s nose in such a manner as to allow it to feed upon the grass without restraint. Hence, as often as the animal attempts to suck, this instrument pricks the cow, and prevents her from letting it flow till the arrival of the milk-maid, who removes the muzzle; so that while she strips two of the teats, the calf sucks the other two; and after the process of milking is completed, the muzzle is replaced on the calf’s nose in the manner above mentioned.

Whether calves are designed to be raised for breed, labour, or feeding, care should be taken that they have a sufficient supply of good pasture; because, if the latter be scanty at first, they rarely, if ever, attain to a large growth. And it may be considered as a general rule, that those

* Culley on Live Stock, p. 63.
calves which are dropped in October or November, are best calculated for increase; as the cow's milk is, at that time, not so well adapted to the purpose of the dairy, while the animal is less susceptible of distempers, and will thrive greatly by the nourishing pastures into which it may be turned in the ensuing spring.

Various plans have been suggested, and tried with considerable success for rearing calves without any, or at least with a small quantity of, milk. The time of weaning them varies, from one fortnight till they are seven weeks old; but the latter period is preferable, on account of the weak and tender state of the calves, if separated from the dam before they are three weeks old. In several counties of England, calves, on being taken from the cows, are, with great pains*, taught to drink *jet, or skimmed milk, in a lukewarm state; for either extreme of heat or cold is hurtful to the beast, and not unfrequently produces fatal consequences. The time selected for this purpose is, from the latter end of January till the beginning of May, about twelve weeks after which, for three or four weeks, they are fed with lukewarm milk and water. Small wisps of fine hay are then placed within their reach, in order to induce them to eat. To-

* Of the patience and attention requisite in teaching calves to drink, a very inadequate idea only can be formed by those who have never witnessed this tedious process. When the animal has fasted two or three hours, the first and second finger of the right hand, being previously well cleaned, are presented to its mouth; of these it readily takes hold, sucking very eagerly. In the mean time, a vessel of lukewarm milk is placed, and supported by the left hand, under the calf's mouth, and, while it is sucking, the right hand is gradually sunk a little way into the milk, so that it may lap a sufficient quantity without stopping its nostrils, which will necessarily compel it to cease, from want of air. Should, however, either from accident or from too sudden precipitation of the hand into the milk, the calf let go its hold, the attempt must be repeatedly renewed till it is crowned with success.
wards the end of May they are turned out to grass, being taken in a few nights, when they have tepid milk and water given them; which is usually continued, though in gradually smaller proportions, during the last month, till they are able to feed themselves, when they totally disregard it. Care, however, should be taken that the grass is short and sweet, and by no means rank or sour. And Mr. E. L'Homedieu, a spirited agriculturalist of New York, (Transactions of the Agricultural Society of New York), is of opinion, that calves taken from the cows were much better in a pasture without water, than in a pasture of equal goodness with water. The reason he assigns (with which, however, we can by no means coincide) is, that, when indulged with water, they drink too much to supply the want of milk; whereas, when deprived of water, they are forced to eat grass, containing some moisture, and soon learn to allay their thirst by eating before the dew is dissipated, and on that account eat more than if they could go to water. But, in the county of Suffolk, calves are usually weaned soon after Christmas; when they are fed with lukewarm milk, or skimmed milk and water, having bran or oats in it, and some very sweet hay by them, till the grass is ready; though, if the farmer have carrots, these form an excellent article of food, and render the use of oats unnecessary.

Another mode of rearing calves has been suggested by his Grace the Duke of Northumberland, the design of which is to render the use of new milk unnecessary, while the expense is reduced in the proportion of two thirds. It is effected in the following manner: let half an ounce of common treacle be well mixed with a pint of skimmed milk, then gradually add one ounce of finely-powdered linseed oil-cake, stirring it till the mixture be properly incorporated, after which it is to be added to the remainder of a gallon of milk; and the whole, being made nearly of the
temperature of new milk, may then be given to the animal; after a short time, the quantity of pulverized oil-cake may be increased. This method has been repeatedly and successfully tried by that nobleman, who, in a communication to Mr. A. Young, (by whom it has also been very advantageously adopted), observes, that the quantities of the ingredients are so small, "that to make thirty-two gallons would cost no more, exclusive of the milk, than about six-pence." The benefit resulting from this practice must be obvious to every rational farmer and breeder; we doubt not, therefore, but that it will be resorted to in every county where milk is an object of particular importance.

An infusion of hay, called indiscriminately hay-tea, or hay-water, has been also applied to the purpose of rearing calves with the smallest quantity of milk. In order to make this infusion, such a portion of fine, sweet hay, cut once or twice, is put into a small earthen vessel, as will fill it, on being lightly settled with the hand. The vessel is then filled with boiling water, and carefully closed; at the end of two hours a brown, rich, and sweet infusion will be produced, not unlike alewort, or strong tea, which will remain good for two days, even during summer, and which is to be used in the following manner:

At the end of three or four days after a calf has been dropped, and the first passages have been cleansed, as already noticed, let the quantity usually allotted for a meal be mixed, consisting, for a few days, of three parts of milk and one part of the hay-tea; afterwards the proportions of each may be equal; then composed of two-thirds of hay-water and one of milk; and, at length, one-fourth part of milk will be sufficient. This preparation (the inventor of which was, many years since, honoured with a gold medal by the Dublin Society of Arts) is usually given to the calf, in a lukewarm state, in the morning and evening; each meal consisting of about three quarts at
first, but gradually increasing to four quarts by the end of the month.

During the second month, according to the mode of treatment stated in the "Essays on Agriculture" published by the society above named, beside the usual quantity given at each meal, (composed of three parts of the infusion and one part of milk), a small wisp or bundle of hay is to be laid before the calf, which will gradually come to eat it; but if the weather be favourable, as in the month of May, the beast may be turned out to graze in a fine, sweet pasture, well sheltered from the winds and sun. This diet may be continued till towards the latter end of the third month, when, if the animal grazes heartily, each meal may be reduced to less than a quart of milk with hay-water; or, skimmed milk, or fresh butter-milk, may be substituted for new milk. At the expiration of the third month, the animal will scarcely require to be fed by hand; though, if this should still be necessary, one quart of the infusion (which, during the summer, need not be warmed) will be sufficient for a day.

The economical mode above detailed has been adopted in some counties of England, with the addition of linseed-cake finely pulverized and boiled in the hay-tea only, to the consistence of a jelly, without employing any milk in the mixture. And; as so many excellent artificial grasses are now cultivated for the feeding and fattening of cattle, we conceive that an infusion of any one or more of them would be found more nutritious than if it were prepared from the promiscuous mixtures of grass usually occurring in common hay.

In the northern counties of England, it is a common practice to give the calves equal parts of milk and sweet whey, made lukewarm; but as this mode often produces scouring, or looseness, we think the following method,
which was, a few years since, communicated to the public by a spirited and experienced breeder, is greatly preferable. For the first four or five weeks he fed them regularly, but oftener than is usually done, with new and skimmed milk; at the end of which time his calves were gradually taught to drink strong water-gruel, consisting of equal parts of bean or oat meal, mixed with one-half of butter-milk, and carefully mixed with the gruel after the latter is removed from the fire. This method of treatment he is stated to have pursued with great success for many years; his calves being strong and healthy, while every thing that may tend to prevent their growth is effectually prevented.

The following mode of rearing these animals prevails chiefly in the vicinity of Abbey-Holme, in the county of Cumberland, where the calves are remarkable for their size, fatness, and fine white colour; before, however, we detail the plan of the breeders of that place, it will be necessary to remark, that their stock is of various ages, in order that their plan may be carried on without interruption. For the first two or three weeks the young calves are fed in the common way; and, at the end of that time, are conducted to a feeding shed. Here two small stakes are driven into the ground for every calf, at the distance of ten inches or a foot from each other; the head of the animal is then put through the intermediate space, a strap or cord being passed round its head, on either side of which there is a ring, which surrounds the stake. By means of this contrivance the calf is prevented from licking itself, which habit would materially affect its health and growth, while it is not so confined as to be hindered from lying down or rising at pleasure. When the calf is reconciled to its new habitation, the Abbey-Holme farmers supply it with better food than it has been accustomed to receive; rightly judging, that the latter part of a cow’s milk is more nourishing, and of a richer quality than that which is first drawn;
by this rule, they divide the milk according to the respective age of the animals, invariably giving the richest part to the oldest calves, so that, as the milk may lessen or improve in quantity or quality, they can, at all times, regulate their stock by diminishing or augmenting their numbers. Another circumstance peculiar to that district is, the varying of the temperature of the feeding-sheds according to the alteration of the different seasons. Cleanliness is also an object of rigorous attention, the place being kept constantly dried, and supplied with a proper quantity of good litter. And in case any of the animals' appetites fail, so that they do not regularly take their food, they are immediately consigned to the butcher, and their place is occupied by the next in age.

In the county of Norfolk, calves are fed with skimmed milk, in which is mixed a little wheaten flour; they have also chopped turnips in a trough, and some hay in a low rack. As soon as these animals learn to eat turnips freely, they are no longer supplied with milk, those roots, with the addition of a little hay, furnishing them both with food and drink. The period of raising calves in the above-mentioned county is from Michaelmas to Candlemas; but the time of feeding them wholly with turnips varies, according to circumstances or accident. Where there are older calves that have been accustomed to these roots, the younger ones soon acquire the method of breaking and eating them, by picking up the fragments left by the former.

Towards the month of March those which are first reared, are turned out among the fattening bullocks during the day, and are sheltered in the night; though, if the weather prove favourable, they are in a few days turned out altogether. In the succeeding summer they are kept in clover, or other luxuriant grasses, and the following autumn are sufficiently strong to stand in the straw or fold-yard. This circumstance is considered as a chief advantage to be
derived from rearing calves early in the season; as those which are raised during the spring require two years' nursing.

The subsequent method of raising calves, by Mr. William Budd, of Boston, in America, which obtained the prize from the Agricultural Society of Massachusetts, we give in his own language, extracted from his communication to that society.

"Take the calves when three days old from the cows, and put them into a stable by themselves; feed them with gruel, composed of one-third barley, two-thirds oats, ground together very fine, sifting the mixture. Each calf is to receive a quart of gruel morning and evening, and to be made in the following manner: to one quart of the flour add twelve of water, boil the mixture half an hour, let it stand until milk-warm. In ten days, tie up a bundle of soft hay in the middle of the stable, which they will eat by degrees. A little of the flour, put into a small trough for them, occasionally to lick, is of service. Feed them thus till they are two months old, increasing the quantity. Three bushels of the above mixture will raise six calves."

Mr. Clift, of the New York Agricultural Society, takes the calf from the cow at two or three days old; he then milks the cow, and while the milk is warm, teaches the animal to drink by holding his head down into the pail; if the calf will not drink, he puts his hand into the milk, and a finger into the mouth, till the beast learns to drink without the finger. After he has been fed with new milk for a fortnight, the cream is taken off the milk, with which an equal or larger portion of thin, flax-seed jelly is mixed, and the whole is given milk warm. Thus, as the spring is the most favourable season for making butter, he is enabled, during the six or seven weeks the animals are kept previously to weaning, to make as much butter as they are worth; a practice which merits the attention of our
English farmers, to whom it will afford a very essential saving, particularly in those counties where butter forms a chief article of manufacture.

In the rearing of calves much, however, depends on the regularity of feeding them; the common practice is, to supply them with food twice in the day, in the morning and at evening, when they generally receive as large a quantity as their craving appetites can take. Hence the digestive organs are necessarily impaired, and numerous animals either become tainted with disease, or perish from the inattention of their keepers; whereas, by feeding them thrice in the day, at equidistant intervals, and allowing sufficient room for exercise, they will not only be preserved in health, but they will also greatly improve in condition.

Veal being a favourite article of diet, the fattening of calves is an object of no small importance, particularly in the vicinity of the metropolis, where the lands are more profitably occupied in other branches of rural economy. Hence various sorts of food are provided, and numerous modes of treatment have been recommended. Their provender is now, for the most part, turnips, potatoes, grains, pollard, and sweet hay; but the most effectual, and consequently the best way, is to keep them in pretty dark places, in coops, lest they should fatigue themselves by sporting too much in the light, which would be injurious to them. Farther, as cleanliness is an indispensable object in fattening cattle, it should, in the present case, be particularly attended to; for this purpose, the coops ought to be elevated at such a height from the ground that their urine may pass freely off; fresh litter should be supplied every day, in order that they may lie dry and clean; and a large chalk-stone should be suspended over the coop, so that the calves can easily lick it. It is also a common practice to bleed them when they are four or five weeks old, and again a little time before they are killed, by which contrivance the whiteness of their
flesh is greatly increased: the quantity of blood taken is almost two quarts, or more, according to the age and strength of the calf. The operation of bleeding is, therefore, frequently repeated by some persons, though it does not appear to be altogether necessary; as the most experienced breeders are of opinion, that it is sufficient to bleed them twice, drawing from them such a quantity at each time as their age and size will allow, without hazard of destroying the animal.

With regard to those calves which are intended for the draught, it will be advisable to accustom them, while young, to be handled and stroked, and tied up to the manger; as they may, when they come to be broke, be handled with less apprehension of danger.

The best time for castrating male, or spaying female calves, undoubtedly is when they are fifteen or twenty days old, as at that time there is least danger, provided they be in full health; though, in conformity to the opinion of some eminent natural historians, this operation is in some places, particularly in Scotland, deferred till the animals are three years old. Formerly this object was effected by tying a strong cord round the small part of the testicles, near the body, till these became completely dead, when they were either suffered to remain till they dropped spontaneously off, or were cut off, and the animal was perfectly castrated. Modern ingenuity, however, has devised a better means of eradicating the testicles, by excision; but, as this cannot be effected without resorting to an experienced farrier, or cow-doctor, we decline to give any directions respecting an operation, which, if unskilfully performed, must prove greatly injurious to the animal. Let it, therefore, suffice to state, that, after the calves are castrated or spayed, as the difference of sex may require, great care ought to be taken, that the wounded part be not exposed to the air, which might otherwise occasion loss of blood or other accidents. For the first two or three days, the animals should be kept quiet
and tolerably warm, and be dieted according to their weakness; but they ought not to be allowed too much drink till they are perfectly recovered, after which time they may be treated in the usual manner. With regard to the diseases of calves, vide infra, Chap. IV. Sect. III.

SECTION V.

Of the Ox: The best Time and Methods of breaking him for Labour. Comparative View of the respective Utility of Oxen and Horses.

The ox is an animal of no small utility for various purposes of husbandry, particularly for the draught, though its real value has only become generally known within a few years.

The most valuable breeds of these animals for working, in this island, are those of Devonshire, Sussex, and Herefordshire, together with the oxen reared in the counties of Somerset, Glamorgan, and Pembroke, the distinctive characters of which have already been specified in the table of the chief breeds of black cattle raised in Great Britain*. We, therefore, proceed to state the principal objects requisite to be attended to in purchasing these animals; for the husbandman, who intends to stock his land, must purchase before he can breed his own cattle; after which the most advantageous methods of working them, together with a comparative view of the merits or demerits of oxen and of horses, will present themselves for discussion.

A good ox for the plough should be neither too fat nor too lean; as in the former case he will be too lazy; and in the latter, he will be too weak and unfit for labour. His body ought to be full, joints short, legs strong, eyes full, his coat smooth and fine, (which latter circumstance is a certain indication of good health), and every part symmetric.

* See Table of the Breeds, prefixed to this work.
cal, or well put together, so that his strength may be easily seen. Another requisite is, that he answer to the goad; and be obedient to the voice; but this animal can only be brought willingly to bear the yoke, or be easily governed by lively but gradual and gentle treatment. Those calves, therefore, which are designed for the yoke, should not be broke earlier than two and a half, or three years, lest they be overstrained; nor should that operation be deferred longer than three and a half, or four years, as they will become froward, and too stubborn to submit to the yoke.

The strength of this animal, when properly trained and managed, is very great, and he has patience to endure fatigue; but, being naturally slow, he must not be exerted beyond his usual pace. The only method by which success can be attained is, by patience, mildness, and even by caresses; for compulsion and ill-treatment will irritate and disgust him. Hence, great assistance will be derived from gently stroking the animal along the back, by patting him, and encouraging him with the voice, and occasionally feeding him with such aliments as are most grateful to his palate. It will also be proper to tie his horns frequently, and after a few days to put a yoke upon his neck, when he should be fastened to a plough with a tame old ox, of equal size; next, the oxen should be employed in some light work, which they may be suffered to perform easily and slowly: thus they will draw equally, and the young steer will be gradually inured to work. After working in this manner, he should be yoked with an ox of greater spirit and agility, in order that the steer may learn to quicken his pace; and, by thus frequently changing his companions, as occasion may allow, he will, in the course of the first month or six weeks of his labour, be capable of drawing with the briskest of the stock.

After a steer is thus properly broken, it will be advisable for the future, to match such as are intended to draw in the
same team, or yoke, attention being paid to their size, strength, and spirit or temper; otherwise, by being unequally matched, they will not only spoil their work, and be greatly disqualified for draught, but also, by being urged beyond their respective natures, through severe usage, they will inevitably receive material injury.

Another circumstance of essential importance in breaking young oxen is, that, when first put to work, whether at the plough or in teams for draught, they be not fatigued, or overheated; till they are thoroughly trained, therefore, it will be necessary to employ them in labour only at short intervals; to indulge them with rest during the noon-day heats of summer, and to feed them with good hay, which, in this case, is preferable to grass. In fact, while oxen are worked, they must be kept in good condition and spirits, by moderate, but wholesome sustenance. Farther, on their return home from labour, it will greatly contribute to preserve their health, if their feet be well washed previously to leading them into their stalls; otherwise diseases might be generated by the filth adhering to them; while their hoofs, becoming soft and tender, would necessarily disable them from working on hard or stony soils. The extremes of heat and cold ought also to be carefully guarded against, as disorders not unfrequently arise from excess of either temperature, and they are peculiarly exposed to fevers and the flux, if chased up and down, especially in hot weather.

The following mode of training and working oxen, which has been successfully adopted in North Britain, we give in the words of the farmer by whom it is practised, from the 3d vol. of "The Farmers’ Magazine," p. 450; a work whose extensive circulation is the best proof of its merit.

"Out of my stock of cattle," says he, "I select, when two years old, (that is, after harvest, when they are rising three), four of my stoutest, best-shaped stots from the field;
These, to accustom with harness, I bind up in my oxen byre every night, for a week or two; and they are then taken out in pairs, and put into the plough with a pair of older-trained oxen yoked before them. This keeps them steady, and prevents their running off. After being yoked in this manner two or three times, I turn them again amongst the cattle in the straw-yard, where they remain until spring. They are then three years old. I yoke them all four, after training them as above stated, in a plough by themselves, which requires a little boy to drive; and in that way they are used until four years old, when they are worked in pairs as horses, by one man only, and do the same work at ploughing; for, at carting, &c. I never use them, having as many horses as do that part of my work. When used in pairs, one man works two yokings, and the cattle only one each. If, however, I had occasion for two cattle-ploughs, each pair might work very well two yokings, the same as horses."

The same intelligent correspondent also remarks, in addition to the above: "If, when three years old, eight stots were worked, four and four alternately, it would be a great relief; and I have uniformly found that cattle, moderately worked, thrive better than those that are idle, or unemployed."

The general character of the ox is, patience and tractability, though young steers sometimes prove refractory and vicious, which, however, is in most instances the result of defective management, or of bad treatment when first broken for the yoke. When, therefore, an ox is unruly or stubborn, it will be advisable to keep him till he is hungry; and when he has fasted long enough, he must be made to feed out of the hand. On his returning to labour, he should be tied with a rope; and if he, at any time, become refractory, gentle measures should be adopted, as above described, in order to bring him to work readily and quietly.
In working oxen to advantage, much depends on the mode of harnessing them, and upon what has been termed the principle of draught. This principle, as Lord Somerville has judiciously remarked, (in his interesting work, "The System followed, during the two last Years, by the Board of Agriculture, &c." 8vo. second edition, 1800), depends on the joint power of the neck and base of the horn. In Portugal, these animals are harnessed in the following manner: a long leather strap is wrapped round the yoke, whence it passes round the lower part of the horns, and is again fastened to the yoke. By this contrivance the heads of the oxen become more steady, while performing their work, and these useful animals are rendered more tractable.

In France, oxen are worked by the head, and are yoked in a manner which is better expressed by the aid of figures than by description. Plate II. fig. 1, therefore, represents a view of the hinder part of the head and neck of these animals in the yoke, as they appear to a spectator; and fig. 2 exhibits a front view of the upper part of their heads, in order to convey a more accurate idea of the mode in which the French oxen are fastened to the bow; this method being, in the opinion of the noble agriculturist above mentioned, the best preparatory step towards introducing the Portuguese manner*.

Connected with the subject of draught is another, which has only received, of late years, that attention which it required, viz. the shoeing of oxen; a necessary operation, which, when carefully executed, will not only conduce to the animal's comfort and health, but also to the farmer's profit; as he will thus be enabled to draw both with greater

* We understand that the Earl of Shannon introduced this method of yoking oxen into Ireland, a few years since, with the happiest success; as two oxen, thus harnessed, were enabled, with great ease, to draw the enormous weight of three tons.
speed and with superior effect. According to the common practice, the animal is first cast, or thrown, and his legs bound together in the usual manner; he is then forced nearly upon his back, and his feet are hoisted up to a convenient height by means of a forked pole, the forked end taking the bandage that binds the feet, while the opposite end is firmly fixed in the sward upon which they are thrown; the farmer then proceeds to affix the shoes in a manner similar to that practised on horses. By this simple contrivance the operation acquires great firmness, steadiness, and conveniency; but it is attended with one great disadvantage, as oxen are apt to become unruly on seeing their companions thus roughly treated; and many valuable cattle are often rendered completely useless. To obviate such accidents, an ingenious machine has been invented in order to secure the animal, by means of short posts. On these the fore or hind legs are fastened, as circumstances may require, and thus the shoes are applied without any possibility of injuring the beast. It has, indeed been suggested*, (and we think the plan might be easily carried into effect,) that if calves, intended to be reared for work, were accustomed, while young, to have their feet taken up, and their hoofs beaten with a hammer; and that, if this practice were repeated during the winter, while the steers are in the yards, they might afterwards be shod in the same manner, and with equal facility as horses.

Few subjects have, of late years, more exercised the ingenuity of theorists, and the attention of farmers, than the question concerning the superiority of oxen to horses. The use of these animals, even under many impediments, has been persevered in for many ages, and will continue in every country where a breed of cattle exists which are active of themselves, and of a form and size well calcu-

lated for labour. And in the ancient law work, denominated *Fleta*, (which is supposed to have been written about the time of Henry I.) we have indubitable evidence, not only that oxen were then commonly used for the purposes of husbandry, but also of their superiority over horses. The author of that work states, first, that two oxen and two horses will plough as much in one day as four horses: secondly, that, in heavy land, oxen make a stronger draught*; thirdly, that a horse requires the sixth part of a bushel of oats per diem, whereas, for a whole week, three one-half measures of oats (ten of which make a bushel) are sufficient for an ox: lastly, that an old horse is of no value, except for his skin; while an ox, after being past labour, will yield a good price when fattened†.

Equally strenuous in favour of these animals is the author of the "Boke of Husbandry," Judge Fitzherbert, who lived in the time of Henry VIII. "It is to be known," says he, "whether is better, a plough of horses, or a plough of oxen, and therein meseemeth ought to be made a distinction. For in somme places a horse-plough is better; that is to say, in every place: whereas the husbandman hath several pastures to put his oxen in, whan they come fro their warke; there the ox plough is better. For an oxe maye not endure his warke, to labour all daye, and than to be put to the commons, or before the herdman, and to be sette in a foule al nyghte without meate. But and he be put in a good pasture all nyghte, he will labour much of all the daye dayely.

"And oxen wyl plowe in tough clay and upon hilly ground, whereas horses wyl stand styll. And whereas is now suerall pastures, there the horse plowe is better, for the horses may be teddered, or tyed, upon leys, balkes, or hades, whereas oxen may not be kept; and it is not used to tedder them, but in few places. And horses wyl goo

*Fleta, lib. ii, c. 73, s. 2.   †Ibid. s. 3.
faster than oxen on even grounde, or light grounde, and be quicker for carriage; but they be farre more costly to kepe in winter, for they must have bothe hey and corne to eate, and strawe for litter; they must be well shodde on all foure fete; and the gere that they shall drawe with is more costly than for the oxen, and shorter whyle it wyll last. And oxen wyll eate but straw and a lyttel hey, the whiche is not half the coste that the horses must have, and they have no shoes as the horses have." [But the practice is now changed as to this point, and the shoeing of oxen, though essentially necessary, is infinitely cheaper than that required for horses.] “And if any sorance come to the horse, or waxe olde, broysed, or blynde, than he is lyttle worth; and if any sorance come to an oxe, wax olde, broysed, or blynde, for iis. and than he is manne’s meate, and as good or better than ever he was. And the horse, when he dyeth is but caryen. And therefore meseemeth, all things considered, the ploughe of oxen is much more profitable than the ploughe of horses*.”

For the length of this extract from the learned judge, (who was himself a practical husbandman, and consequent-ly has here given the result of many years experience,) its excellence, we trust, will be a sufficient apology; as, when taken in connection with the account of Fleta, it will present a striking record, or document, of the superior utility of oxen over horses. In order, however, that this important subject may be placed in as clear a point of view as possible, we shall proceed to contrast the respective services of the two animals, supporting our remarks on modern data; though, probably, some of the preceding strictures may seem to render them unnecessary. And, when it is considered, that oxen, fit for grazing, are now of rare occurrence, it becomes daily a question of greater moment, particularly as it respects the supply of our navy.

I. With regard to their original price, or cost.

The prime cost of an ox, upon an average, is at least one half less than the price of a horse; hence it is obvious, that an ox of the value of 7l. or 8l. will perform the same quantity of work as a horse worth 14l. or 16l. This is a circumstance of no small importance to a young farmer, to whom labouring cattle are the most expensive part of his stock, as he can thus be enabled to branch out his capital into various useful channels.

II. With respect to labour.

By well-known means the nature of the bull is tamed; and, when properly broken, the ox becomes as tractable, and may be trained to the plough or to draught as easily as horses. Of this we have numerous instances. Messrs. Culleys, of the county of Northumberland, employ 150 oxen in the draught, which practice they have followed, with great success, for more than thirty years. The animals are used singly in carts, and two in a plough, with cords, without a driver; and thus they perform their allotted work of ploughing, carrying corn, dung, &c. in all respects as well as two horses, though not with equal celebrity. The late Lord Kaimies states*, that Colonel Pole, lately deceased, of Radburne, in Derbyshire, ploughed as much ground with three oxen, as his neighbours did with four or five horses; feeding them in summer with grass, and in winter with straw, when moderately worked, or, when much worked, with hay or turnips. The late Right Hon. Edmund Burke, at his ground near Beaconsfield, in the county of Bucks, ploughed one acre per diem with four

* "The Gentleman Farmer," p. 30, 5th Edit. 1802; an interesting and practical work on husbandry, to which we are indebted for some of the following hints and facts.
oxen, while his neighbours performed the same work with an equal number of horses.

For the two following facts, which evince the superiority of oxen, even under circumstances unfavourable to these animals, we are indebted to that enlightened agriculturist, Lord Somerville*, of whom we have already had occasion to make honourable mention.

At the last meeting, in 1803, of the Dublin Society, his lordship was informed, by a spectator of undoubted veracity, that several ploughs were entered for the prizes given; and, to the surprise of everyone, the oxen beat the horses in speed; they were worked in pairs only, without drivers. These animals, he states, were not selected from the breeds most esteemed for labour, but from the oxen of that country.

Of the succeeding instance, Lord S. was himself an eye witness.—In May, 1803, a meeting was held at Barnham Wyck, in the county of Essex, to award three prizes which were given for the best ploughing. Upwards of twenty ploughs started, three of which were each worked by three pair of oxen, without drivers. These animals were bred on the estate, and of a sort which are deemed by no means well adapted to labour; the horse ploughs were picked teams. The difference of time in finishing the work allotted was, to the best of his lordship's remembrance, about twelve or fourteen minutes between the average of the horse and ox teams; so that, supposing them to be an hour and a half longer in their day's work, the difference in the time of rest will be, if any thing, in favour of the oxen: because animals which perspire by the tongue do not require the dressing and attention demanded by those whose perspiration escapes by the skin.

The following is his lordship's method of working oxen; the animals are broken in at three years old, their

first half year's work being easy. At six years old they are sold to graziers, and in eight months they come to Smithfield good beef. In the intervening period his work is done at the rate of about eighty acres of tillage to four oxen; and his twelve oxen, exclusive of the three-year-old steers, will work thirty acres of land per week, when not employed in carrying lime or manure, which is ten acres per week for each four oxen, or five acres for each pair; that is, two acres per diem for four days in the week, for each team of four, allowing them two resting days. Thus their daily labour is completed in seven hours and a half, which gives them sixteen hours for rest. 

Lord S. remarks, that if they were allowed corn they would probably do more work; and, if they did less, he would not employ them at all. He allows one horse to every 100 acres of land, for extra work, and no larger number.

Lastly. Before we conclude the present contrast, as it respects labour, we would observe, that oxen are preferable to horses for steady draught, as they uniformly pull to their strength, without variation; whereas the last-mentioned animals are apt to stop on encountering the slightest resistance. And though it is objected, that oxen are unfit for draught in mountainous situations, yet, let it be recollected, that under such circumstances no draught can well be used; and that the descending of steep hills is, in all respects, as dangerous to horses as to oxen. In addition to the facts already stated, it may be added, that, notwithstanding oxen have less air and spirit than a horse, their motion is not materially slower; and as the labours of husbandry are regular and progressive, the step of these animals will be found little inferior to that of the horse. They are, indeed, reputed to be less expeditious for galloping or trotting; but repeated instances have occurred, where Sussex oxen have beaten horses at plough in the deepest clay; and the Herefordshire breed is admitted to be superior to any
other in long journeys, for conveying chalk, or other heavy substances, over a hilly and flinty country road. In the north of England, we understand that it is not an unfrequent occurrence, to see a light ox saddled, and briskly trotting along the road, obedient to his rider's voice: the Devonshire cattle also walk with uncommon speed; and if four or five horses can till 100 acres of land, the same work might doubtless be equally well performed by a similar number of the Devonshire, or Herefordshire breeds, provided they were trained and fed with a special view to speed, with the same care as horses.

III. Comparative expense of keep and general savings.

1. Oxen are easily supported, during the severity of winter, on straw, turnips, and other vegetables, of which a particular detail will be given, infra, Chap. II. Sect. II. Besides, as ruminating animals possess stronger digestive organs, every thing capable of affording nourishment is extracted from their food.

2. Every day that oxen are employed, they earn more than their keep; while, if properly fed, he will require no other care.

3. The gear necessary for a pair of oxen may be procured at a very moderate price.

4. At the end of five, six, or seven years, during which they will have more than compensated the cost of keeping them,

1. Horses require to be fed with hay, oats, beans, articles which can only be purchased at a heavy expence. The digestive powers of a horse are weak, so that, upon an average, two-thirds more are necessary for him than are required by an ox, in order to afford the same nourishment.

2. A horse not only requires more stable attendance than oxen, but also often exhausts the property of little farmers, who exert themselves in order to keep a fine team.

3. The harness of a team is, in general, an expensive article, especially when the vanity of the owner induces him to have it decorated with paltry brazen ornaments.

4. Horses become less valuable every year they are kept. They are liable to spasms, farcy, glanders, foundering,
they are in prime order for fattening; and, when fit for sale, produce to their owner a handsome sum, varying indeed according to the state of the markets, but ultimately bringing him a considerable clear profit. The same event will follow, if, through accident, the beast is lamed, or rendered unfit for work.

cankers, and a host of diseases too numerous to be here specified, from all which oxen are exempted, (these animals being subject to few diseases, except a scouring, or looseness, that reduces their value); while horses are, by sudden illness, or lameness, speedily diminished in value, from forty to four guineas, and at length become food for dogs, their hide only being in any degree serviceable to mankind.

Another advantage arising from the keeping of oxen preferably to horses will be, the introduction of a more lenient conduct towards those useful animals; and, as has been judiciously observed, in proportion as ox teams are used, they certainly diminish animal suffering; for no man will work his ox team so hard, or feed it so inadequately, as horse teams are sometimes worked and supported merely with the view of gratifying a false vanity.

The following comparative statement* of the expense of keeping, management, &c. of horses and oxen will probably elucidate the facts above attempted to be brought together.

<table>
<thead>
<tr>
<th></th>
<th>HORSE.</th>
<th>OX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime cost of a horse at three years old</td>
<td>£30 0 0</td>
<td>Prime cost of an ox at four years old</td>
</tr>
<tr>
<td>Keep, shoeing, attendance, &amp;c. &amp;c. for ten years, at £30 per Ann.</td>
<td>300 0 0</td>
<td>Keep, &amp;c. for ten years, at £10 per Ann.</td>
</tr>
<tr>
<td>Deduct the value of skin and carion</td>
<td>10 0 0</td>
<td>Deduct the value of fat 40 0 0</td>
</tr>
<tr>
<td>Total cost of horse</td>
<td>£328 19 0</td>
<td>Total cost of ox</td>
</tr>
<tr>
<td>Ditto of ox</td>
<td>80 0 0</td>
<td></td>
</tr>
<tr>
<td>Difference in favour of the ox</td>
<td>£248 19 0</td>
<td></td>
</tr>
</tbody>
</table>

On this statement we have only to observe, that, as it is a fact that one draught horse will, exclusive of hay, consume more corn than a family of ten or twelve persons; and, as it is morally impossible that small farms, worked by heavy horses, can find constant employment for them, the community must, under such circumstances, not only sustain an annual loss to the amount of several millions, but also lose the benefit of a supply of good beef for home consumption, and especially for the use of that meritorious class of subjects, the British Sailors.

In the preceding estimate of the merits and demerits of horses and oxen, though it has been endeavoured to show that the latter animals are infinitely superior, and consequently preferable, to the former, yet we would be understood to recommend the use of oxen only where they suit, or are consistent with local and other circumstances; for, doubtless, where counties, or districts, do not possess a breed of cattle well calculated for work, as oxen; or on small farms, from which fairs must be attended at a considerable distance to purchase a few, consequently at a great expense per head, and possibly without a supply of land for fattening any, the loss in such case is almost certain. It will, therefore, be proper for the farmer, who is thus situated, to avail himself of the bulls of the country, which may be advantageously substituted for, and probably much cheaper than oxen, and which may be broken in and worked with equal facility.

As, however, there is some business on a farm, in the performance of which horses are greatly superior to oxen or bulls, the husbandman will find it conducive to his interest to keep a few draught horses for that purpose.

We conclude the present discussion with the following remarks of Mr. Culley:—"Much more might be said upon this important subject; but I will, at present, only add, that I heartily wish our legislature would take this
matter into consideration, and give premiums to encourage the rearing and drawing of oxen, and also to promote the breeding of the best kinds of stock, as there is little doubt but it would have the most beneficial effects. It is true, that many of our agricultural societies do give premiums for the above purposes; but these, though highly meritorious, are only partial, and confined to certain districts, while the influence of the other would be general and extensive*.

SECTION VI.

Of the Sheep.

Among the various animals given by the benevolent hand of Providence for the benefit of mankind, there is none, perhaps, of greater utility than the sheep; which not only supplies us with food and clothing, but also affords constant employment to numerous indigent families, in the various branches of the woollen manufactory; and thus, by inducing habits of industry, contributes, in no small proportion, to the productive labour, and commercial prosperity and opulence of this highly-favoured island.

In a wild, or natural state, the sheep is a vigorous animal, lively, and capable of supporting fatigue; when domesticated, indeed, it loses these properties, but amply compensates for the absence of them by the superior advantages arising from the rearing of this sort of cattle. In fact, sheep constitute a material part of a farmer's live stock and profits; and, as particular attention has, of late years, been bestowed on the improvement of the respective breeds, we shall first refer the reader to the table prefixed

* Culley on Live Stock, p. 86.
OF THE SHEEP.

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to this work; which will, we trust, convey an adequate idea of the different varieties, together with their specific characters, and the peculiar advantages they respectively possess. The general management of these animals will afterwards form a subject of discussion.

With respect to the selection of sheep, as an article of live stock, the same principle of symmetry of form, and other requisites to the formation of a good breed of black cattle, which have already been specified*, are equally applicable. The breeder, or grazier, should also carefully examine the nature of his land; and having attentively weighed its relative degrees of fertility, and his various sources for supplying food, he may then proceed to purchase that breed, which, after mature consideration, he has reason to believe is best calculated. In this point, the synoptic table of breeds and varieties prefixed to this work will probably afford some guide; but there are some additional hints, to which we would call his attention. In the first place, therefore, he should take care not to suffer himself to be led into needless expences, in purchasing fashionable breeds, by which his affairs might become involved, and his exertions in other objects be rendered nugatory. Secondly, the difference of the land, whence the sheep are to be purchased, ought to be attentively weighed; for with sheep, as with cattle stock, if any breed be brought from a rich to an inferior soil, it must necessarily decrease in value and condition. Not only, therefore, must sheep be suited to the pasture; but they should also be purchased from poorer land than that of the intended proprietor, for on attention to this last point depends their immediate thriving.

Having thus noticed the general objects in selecting sheep, we now proceed to state some particular points that will demand the breeder's attention; and as, in all cattle,

* Vide Supra, Chap. I. Sect. I.
the *male* has the greatest influence, shall specify those requisites which are essential to a good *ram*.

"His head should be fine and small; his nostrils wide and expanded; his eyes prominent, and rather bold and daring; ears thin; his collar full from his breast and shoulders, but tapering gradually all the way to where the neck and head join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, which must at the same time join so easy to the collar forward and chine backward, as to leave not the least hollow in either place; the mutton upon his arm, or fore-thigh, must come quite to the knee; his legs upright, with a clean, fine bone, being equally clear from superfluous skin and coarse, hairy wool, from the knee and hough downwards; the breast broad and well forward, which will keep his fore-legs at a proper wideness; his girth, or chest, full and deep, and, instead of a hollow behind the shoulders, that part, by some called the fore-flank, should be quite full; the back and loins broad, flat, and straight, from which the ribs must rise with a fine circular arch; his belly straight; the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his *twist* (i.e. the junction of the inside of the thighs,) deep, wide, and full, which, with the broad breast, will keep his four legs open and upright; the whole body covered with a thin pelt, and that with fine, bright, soft wool.*"

Such is the description of the animal recommended by Mr. Culley, who observes, that the nearer any breed of sheep comes up to it, the nearer they approach towards excellence of form; and there is little doubt, but if the same attention and pains were taken to improve any particular breed, which have been bestowed on the *Disley breed,* (so denominated from the residence of the late Mr. Bakewell,

* Culley on Live Stock, p. 103, 104.
its first selector,) the same beneficial consequences would be obtained*.

In addition to the symmetry and other requisites above specified, it may be remarked, that, as the fine quality of the wool depends greatly upon the breeder's judgment, the young grazier will find it beneficial to his interest to consult some experienced wool-stapler, or clothier, who, from his occupation, being accustomed to examine wool, is consequently enabled to determine, not only with accuracy, but also with a view to the breeder's real profit. Farther, the pelt, or coat, should be attentively investigated, lest it be stitchy haired, in which case the wool will be so materially damaged, in the course of two years, that the injury cannot be recovered for twelve or fourteen years, unless the whole flock be changed.

With respect to the time, or proper age for purchasing sheep intended for breeding, there is a difference of opinion: but the most experienced breeders recommend these animals to be procured, a short time previously to shearing, from the farmer, grazier, or owner's house; because they will then be seen in their natural state, and the real depth of the staple may also be easily ascertained, without the possibility of any fraud or imposition being practised on the buyer by the vendor.

Ewes generally breed at the age of fifteen or eighteen months, though many experienced breeders never admit the ram till they are two years old. Much however depends, in this respect, on the goodness of the food, as well as on the forward or backward state of the breed; and from the great profit which these useful animals afford to their keepers, they require no inconsiderable attention to be bestowed upon them.

* For the peculiar advantage of this excellent breed, the reader is referred to the synopsis already noticed.
THE COMPLETE GRAZIER.

The choice of ewes, therefore, ought to be made with care and discrimination, not only as to the characteristic marks, which ought to be the same as those of the ram, but also with regard to the breed; for, with sheep, as with other cattle stock, no certain degree of excellence can be attained, unless the female possess an equal degree of blood with the male. In particular, a purchaser should see that the animals be sound; and, in order to ascertain this point, it will be advisable to examine whether the teeth are white, the gums red, the breath not fetid, the eyes lively, the wool firm, and the feet cool; qualities these which afford a certain criterion of health or disease.

Of equal importance is the proper adaptation of rams to the ewes; and, in attending to which point, the conduct of the late Duke of Bedford (whose memory every real friend to his country must revere, notwithstanding the recent misplaced aspersions on his character) deserves to be imitated by every attentive breeder. Previously to drawing off any ewes for particular rams, it was his constant practice to select every ram, together with the lambs begotten by it in the preceding year, from the rest of the flock, and confine them in separate pens, in order that he might examine them and their issue, and thus be enabled to make a proper determination.

Ewes bring forth one, two, and sometimes three lambs*.

* The most prolific sort is the Teeswater variety of the Lincolnshire breed, of which Mr. Culley has given the following instances. An ewe belonging to a Mr. Eddison, when two years old,

In 1772, brought him four lambs,
In 1773, - - five lambs,
In 1774, - - two lambs,
In 1775, - - five lambs,
In 1776, - - two lambs,
In 1777, - - two lambs;

and of these the first nine lambs were yeaned in eleven months.
after a gestation of five months, or twenty weeks; hence the sheep-farmer, or breeder, may, in general, by considering whether he has sufficient grass to support the ewes and their progeny in the spring, ascertains the most advantageous period for lambing; or, in the event of a failure of pasture, whether he has a stock of turnips adequate to their maintenance till there is sufficient herbage to supply them with food.

The usual time of weaning is towards the end of March, or early in April, consequently the rams are, according to the general practice, admitted in the commencement of October. But in the county of Dorset, where the ewes are, from a peculiarity in their constitution, capable of bringing lambs twice in the year; and also in the southern and south-western districts, where large quantities of house-lamb are raised for the table, it is more profitable to deviate from this plan, and so to admit the ram, that the lambs shall be dropped from four to six weeks, or more, earlier.

The strength and beauty of sheep stock also greatly depend on the number of rams allowed to serve the females. While the former are young, fifty or sixty should be the utmost extent; and, as they advance in years, the number may be gradually increased; without these precautions, the lambs would not only be deficient in number, but also point of strength.

Various expedients have been resorted to, in order to make the ewes blossom, (i.e. to want the ram); among others, is the practice of worrying them with small dogs kept for that purpose, in consequence of which they become warmed, so that they seldom refuse the ram. But it is much better, and certainly a more rational plan, to keep the rams and ewes in different pastures, till the time when they are intended to be brought to the rut; and for about five or six weeks before, let them have somewhat better
pasture than they are usually accustomed to, by which expedient they will be disposed to take the ram the sooner. In fact, it is with sheep as with other cattle, the female must be in a certain state desirous of the embraces of the male before the latter will attempt to serve her; and this object can only be attained by increasing the richness of their food a short time before they are required to couple; for, in proportion to the excellence or poverty of their food, the bodily vigour of these animals must evidently increase or diminish.

During the period of gestation, ewes require great attention, lest any accident should befall them, and occasion them to slip their lambs; and if the latter should take place, it will be proper to separate them instantly from the rest of the flock. It will, therefore, be necessary to keep them in the same manner as cows while going with calf, viz. upon a moderate, or tolerably good, sheltered pasture, where no object can disturb them; though, if this should fail, it will be advisable to give them turnips, or similar green food, under the like precautions, till within the last two or three weeks before their weaning. In the breeding of cattle, indeed, it is a maxim, which ought to be steadily kept in mind, that nothing can be more prejudicial to the females than to fatten them during gestation; and with respect to ewes in particular, this rule should be more carefully observed, than with regard to any other animal; for, if they be fed too high while they are going with lamb, they will undergo great difficulty and pain in weaning; whereas, unless they are put into a little heart before that period arrives, they will not only be deficient in strength at the critical moment, but also be destitute of a sufficient supply of milk for the support of the lamb, and consequently both the dam and her progeny must be greatly weakened, if they do not actually perish from such mismanagement.

As the time of weaning approaches, the attention and
assiduity of the shepherd, (if there be one), or of the breeder, ought proportionally to increase, as it sometimes becomes necessary to assist nature in cases of difficult parturition; and also, if in the open air, to drive away crows and similar birds of prey, which might otherwise assault the newly-dropped lambs; and pick out their eyes, notwithstanding all the efforts of the dam.

As soon, therefore, as the ewes are expected to begin to yean, they ought, every night, to be folded in a standing littered fold, on one side of which should be a warm cottage-hut, provided with a chimney, and with a stove for warming milk, and also with a bed on which the shepherd may lie down. Here he is to sleep during the lambing season, that he may be ready to watch, assist, and tend any ewes which he observes to be very near lambing, and, if necessary, to give aid to the young animal. Mr. Young, to whom we are indebted for this hint, remarks, that some considerable Norfolk farmers have such huts on four wheels, to draw about with the flock wherever they may be; but he justly conceives, that it is a far preferable method to have one littered, and well-sheltered, standing fold on a farm of moderate size, and two or three conveniently placed on a large one, to which the flock may be taken without any distant driving.

Farther, after the lamb is yeaned, it will be necessary to examine, as early as possible, whether it be as strong as from concurrent circumstances there may be reason to expect; for, in the contrary case, it should be housed with the dam. And, if the ewe also be weak, she should be kept on good grass pasture (as turnips, however useful in other instances, would, in this case tend to make them mortify*) till she has a proper supply of milk for her lamb, which should, in the mean time, suck another ewe.

As the feeding and fattening of sheep will form a subsequent article of discussion, and the rearing of house-lamb will be noticed in the next section, we shall at present only state a few hints connected with this part of our subject, prior to the lamb's being weaned.

It has already been intimated, in the preceding page, that turnips are of great service in giving a flush of milk to ewes, which are not weakened by difficult parturition; and as many drop their lambs at a very early period in the year, great care is necessary in supplying them with those useful roots, so as to insure a sufficient quantity. If the land be liable to be poached by the sheep, the best mode is to draw the turnips, and cart them to a dry pasture, where the sheep may be baited with them once or twice in the day, proper attention being bestowed that the animals eat the whole, without committing any waste; a circumstance which, if duly observed, will afford a certain criterion of the quantity necessary for each meal, or bait, while the stock of roots will be consumed in the most beneficial and economical manner. On dry lands, indeed, a different practice may, with advantage, be adopted, by eating the crop on the land, hurdling off a certain quantity for the flock; and, as they consume these pretty clean, by extending the hurdles farther. By this method, no inconsiderable degree of trouble is saved; and, on whatever land these roots are given, provided the soil be dry, great benefit will uniformly result from such practice.

During very wet, or stormy weather, or in deep snows, it will be necessary to bait the ewes and their young progeny on hay. With some farmers it is usual to drive them to hay-stacks, where they meet both with shelter and with food; a measure which is by no means consistent with the economy that ought to exist in every department of farming business. By others, again, the hay is given in
moveable racks, and a stated portion *per diem* is allowed: "it is, indeed, an excellent method," observes the intelligent agriculturist, Mr. Young, "to allow them in their racks a small quantity of hay daily, while on turnips, let the weather be good or bad; but this is not absolutely necessary." He also remarks, that, in some parts of the kingdom, the most experienced farmers give their ewes and lambs bran and oats, or oil-cakes, in troughs, while these animals are feeding on turnips; but the ex pense attendant on this practice can only be repaid by a good breed.

By the course of feeding here detailed, the sheep may be successfully supported till the month of March, after which time no intelligent breeder will allow any turnips to be seen on the ground. In fact, by the period last-mentioned, the stock of turnips is generally consumed; so that every attention should be paid to have a proper supply of spring food. Among the many expedients resorted to for this purpose, may be mentioned the turning of sheep into a spot of rye sown for the purpose, or into crops of wheat, in order to feed them off; an expensive practice, which however cannot be adopted on farms that are appropriated *solely* to the rearing and grazing of cattle. Other resources are, the letting the animals run over the clover and pastures of the farm; hence the crops of hay, and pastures for large cattle, receive material injury. Farther: others, with a view to avoid these extravagant practices, keep the turnips so that their shoots may become an object of sheep food; and also have an adequate spot of land, under ray grass and clover, ready to take the ewes and lambs from turnips, before they are turned in upon the pastures. But, notwithstanding the various advantages which the last-mentioned expedient undoubtedly possesses over the former modes, as the roots become sticky and hard after the tops have sprouted, and, (to omit many other inconveniences), as it
requires a great extent of ground to keep 100 lambs and ewes in this manner, *turnip cabbages*, the *ruta baga*, *green borecole*, (which, being impenetrable to frost, will shoot during the winter, and may be fed off several times), and especially *burnet*; all afford singularly useful crops for spring feed. Of the vegetable last noticed Mr. Young says, one acre properly managed will, at this season, yield considerably more food than an acre of clover and rye-grass. It possesses the peculiar property of maintaining its verdure throughout the winter; so that, under deep snows, some luxuriance of vegetation may be discovered. In November, it should be four or five inches high; and, by February, the crop will gain two or three inches in growth in the young leaves, when it will be ready for sheep.

Infinitely preferable to any of these useful articles of spring feed for ewes and lambs, *is rouen*, or the *after-grass*, kept on dry meadows and pastures after the hay-harvest is concluded. Although a field of *rouen* presents an unpromising aspect at a distance, in colour not unlike very bad hay, yet when this covering is removed, a fine green herbage, from five to six inches in height, will appear; the whole of which is eaten with avidity by the ewes and their young progeny, who are thus supported till they are turned into the pasture.*

With regard to the best time for *weaning* lambs, much

* The treatment of sheep, when formed into flocks, and the various modes of fattening them, will be discussed, *infra*, Chap. II. Sect. IV. Mr. Young gives it as his opinion, that *rouen* is the cheapest mode of keeping a full stock in April. If of a tolerable quality, he estimates that it will carry ten ewes on an acre, together with their lambs, through the whole of April; and computes its relative value to be, in autumn, 10s. or 12s.; in the spring, from 30s. to 40s. per acre; and, if the season be backward, that a farmer who possesses it would not be induced to dispose of it for a more considerable sum.
depends upon the period, or season, when they were weaned; When a lamb is to be kept for breed in a good common pasture, it is the practice, in some counties, to wean it at the end of about four months, in order that it may become strong, and that the ewe may acquire strength, and go quickly to blossom. In others, which are more mountainous and poor, the lambs are weaned a month earlier. But, whatever influence local customs may have in this respect, this business should be performed before the expiration of July; and, as it is of essential importance to their future growth, and consequently to the breeder’s profit, that due provision be previously made, it will be proper to remove the lambs to a distance from the ewes, to such fresh food as may be most convenient. In the opinion of Mr. Young, clover, while in blossom, is the most forcing food; sainfoin rouen may also be successfully employed for the same purpose; but, if the farmer, or breeder, possesses neither of these succulent vegetables, he ought, at least, to have reserved a sweet bite of fresh pasture-grass. On weaning the young animals, their dams may be milked two or three times, in order to relieve their udders, which would otherwise become painful.

Various ages are mentioned as being most proper for gelding those lambs which are not intended to be raised as rams for breeding; the sooner, therefore, this operation is performed, it is the better for the animal, which is more able to support it while young, and running with the dam, and when there is less danger to be apprehended, lest any inflammation should ensue. The time best calculated for this purpose, in the opinion of the best farmers and breeders, is within the first fortnight, unless the lambs are unusually weak, in which case it will be advisable to defer castration for two or three weeks, or such longer term as may be expedient, till they acquire sufficient strength.
The shearing of sheep, and the profit thence derived from the wool, form a very considerable article of rural economy. The most proper time for this purpose must be regulated according to the temperature of the weather, in the different parts of this island. If the weather be hot, the month of June may be fixed for shearing, or clipping, these animals, though some breeders defer it till the middle of July; under the idea, that an additional half pound of wool in every fleece may be obtained, in consequence of the increased perspiration of the sheep. An early shearing, however, is preferable, where the weather and other circumstances will admit of the operation being performed; because the new wool will not only gain time to get a-head, but the animal will also be secured from the attacks of the fly, to the depredations of which it becomes liable by delaying the operation.

Previously, however, to shearing, the sheep ought to be washed, in order to remove the dust and other filth which they may have contracted; this is usually performed by men standing in the water, who, not unfrequently, take serious colds, or are otherwise indisposed in consequence; while their employer is put to a useless expence, in order to supply them either with a medicated liquor, known in some counties by the name of lamb's wool, or with ardent spirits. To prevent these inconveniences, as well as the abuses resulting from the careless or negligent manner in which the washers do their work, Mr. Young proposes to "rail off a portion of the water," (either of a running stream or of a pond), "for the sheep to walk into, by a sloped mouth at one end, and to walk out by another at the other end, with a depth sufficient for them at one part to swim; pave the whole; the breadth need not be more than six or seven feet; at one spot, let in on each side of this passage, where the depth is just sufficient for the water to
flow over the sheep's back, a cask, either fixed or loaded, for a man to stand in dry; the sheep being in the water between them, they swim through the deep part, and walk out at the other mouth, where there is a clean pen, or a very clean, dry pasture," or rick-yard, "to receive them for a few days, until they are thoroughly dry, and fit for the shearsers, the lambs being first separated from the other sheep, and confined in distinct pens. Of course," adds that enlightened agriculturist, "there is a bridge-railway to the tubs, and a pen at the first mouth of the water, whence the sheep are turned into it, where they may be soaking a few minutes before being driven to the washers."

The clipping, or shearing, of sheep is performed in two ways, and usually in a barn, or similar shady place. The first and most ancient, or common way, is done longitudinally; this mode is attended with considerable difficulty, and is seldom well executed; hence Mr. Young thinks it probable, that one or two ounces, upon an average, are left on each sheep, which greatly impedes the growth of the next year's wool. The second, and improved method, consists in cutting circularly round the body of the animal, the beauty of which is, in consequence of this, believed to be increased, while the work is more uniformly and closely executed. This mode has been introduced from Lincolnshire into Bedfordshire by the late Duke of Bedford; by Mr. Coke, of Holkam, into Norfolk; and by the Earl of Egremont into the county of Sussex, whence its utility and convenience will probably be a means of dispersing this practice into other grazing counties.

During the whole process of washing, as well as of shearing sheep, it will be advisable for the farmer himself to superintend those operations; and especially to see that the clipper do not wound, or prick, the animal with the edge or point of his shears; otherwise the flies, abounding in the sultry heats of midsummer, will instantly attack the
sheep, and sting them to very madness. The same precautions are applicable to the shearing of lambs, which are usually washed and clipped about five or six weeks after the rest of the flock, though such practice is disapproved by some breeders, who accordingly shear the whole at the same time. And lastly, it will be requisite that he see the wool carefully clipped off, and properly wound up, lest any impure particles, or extraneous substances, be mingled with the wool, the sale of which might otherwise be injured.

In the preceding details, we have spoken of one annual shearing; but experiments have been made by some enterprising breeders, tending to show that, in certain cases, long-woolled sheep may be shorn twice, and even three times in the year, without the animal receiving any material injury. And Mr. Ellman, a spirited farmer of Glynd, in Sussex, clips off the coarsest wool on the thighs of his South-down flock, (the first of that breed in this island), and docks them about four weeks before the usual time of washing and shearing. The wool, thus severed, he sells, as locks, for 3½d. per pound, each sheep yielding, upon an average, four ounces. He is said to find this method very beneficial, as the animals are kept clean and cool during hot weather; and from the success with which this method was practised, it has been adopted in other counties with different breeds of sheep.

A more singular mode was recently tried at the French national farm, at Rambouillet, the result of which is stated to be, that the fleece of sheep improves greatly by being suffered to grow for several years; and that the fleeces of some sheep, which were shorn last summer (1804) for the first time for three years, were equal, in point of staple, to those of three other, which were annually shorn, and produced a larger sum.

We state these facts for the consideration of the philosophic breeder; though, with regard to the last experiment, we confess ourselves at a loss to reconcile the idea, of the
very great degree of heat which the French sheep must have felt with such a weight of wool; especially, as it is the opinion of all well-informed breeders, that an excess of heat is as hurtful to these sheep as excess of cold.

After sheep have been clipped, it is usual to mark them with ochre, tar, ruddle, or other colouring matter; but, as it sometimes becomes difficult to wash the stains of these substances out of the wool, another composition was suggested by the late Dr. Lewis. It is prepared by mixing finely-pulverized charcoal, or lamp black, (which is better, where it can be procured) with such a quantity of tallow, over a moderate fire, as will produce a black colour, and a proper consistence; and, with the view of rendering this preparation more durable, Dr. L. states that one-fourth, sixth, or eighth part of tar, may be incorporated with the tallow; and that wool, which has been marked with such mixture, may be easily cleansed therefrom, by washing in strong soap suds.

In cattle-farms, in general, it is of great importance, to dispose, at certain times, of such beasts as either become unprofitable, or are sufficiently fat for sale; and, with regard to sheep, in particular, it is highly necessary to pursue the same management, and to replace old ewes, by an equal number of the best and most vigorous female lambs; in order that the value of the flock may not be diminished. In the southern counties of this island, the severing of sheep usually takes place about six, eight, or ten weeks after the shearing is finished, or in the course of the middle of August. In making this selection, great care should be taken, to chuse those only which give indications of their being of the true breed, (whatever that may be); and, according to their comparative strength or weakness, to regulate their pasturq. Hence it will be proper to place those animals which are designed for feeding or fattening by themselves; the ewes by themselves; the wether or wether hogs, (i. e. males,
whether castrated or not, that are of one year's growth), and those, or females, that are two years old, by themselves; and the older wethers and rams by themselves; and lastly, the lambs by themselves; otherwise the stronger animals will injure such as are weak, and prevent them from taking that food which would be most beneficial for them.

When a farm is thus stocked with a proper assortment of sheep, it will be necessary for the owner to inspect them often, at least twice in the year, particularly in the winter; and, if the severity of the weather or season have proved fatal to any, he should replace them with others from sound flocks, and as nearly of the same size, quality, and property, as his own stock, as the difference of circumstances will admit. At such annual, or half yearly musters, it will also be proper to dispose of those animals, which do not thrive upon their allotted grounds; but, independently of these examinations, the shepherd ought constantly to continue with his charge; as they are liable to various maladies, which (if not speedily attended to) will carry them off in a few minutes.

SECTION VII.

Of the Treatment and Rearing of House-lambs.

In the preceding section, the treatment of lambs intended to be kept for stock, has been chiefly regarded; but, as the price given in the winter, in the metropolis, and in other places where there is a demand for young lambs, is often very considerable, we shall, at present, confine our attention to the rearing of those animals in the house, where they are denominated house-lambs.

In this branch of rural economy, two circumstances are worthy of notice: 1. To put the rams and ewes together at such a time, that the lambs may fall at the proper season;
an object which may be easily effected by any skilful shepherd: and, 2. That appropriate places be provided for their reception, where the suckling of house-lambs is intended to be regularly followed, it will be necessary to erect a house of such proportions, as the probable extent of the business may require, and to divide the building into stalls, in order that each lamb may be more conveniently suckled, and confined. Care should also be taken, not to crowd too many into one house at the same time; as the increased degree of heat, thus occasioned, will render the place unwholesome.

The breed of ewes, best calculated for producing house-lambs, is the early Dorsetshire sort, particularly those whose lambs die fair, in the language of the flesh market; i.e. whose flesh is of a delicately-white colour: and from prolific variety the demands of the luxurious in the metropolis are supplied. The dams in that county are fed with hay, oil-cake, corn, cabbage, or any other green food afforded by the season; which is given in an inclosure adjoining the apartment where the young lambs are confined. The last are shut up in small dark cells or calms, from which the light is excluded; excepting at the intervals when the shepherd suckles them upon the ewes.

Where the system of suckling is carried on to a great extent, it will be advisable to mark the lambs, in order to ascertain which has been longest suckling on the bastard ewe, (i.e. such as suckle strange lambs, or have lost their own); as such lambs ought to suck a-head, or be permitted to take the first milk.

As the ewe's milk is the chief support of the young lambs, (though, in the intervals of suckling, some wheat straw may be given them in racks, or wheat or white pease in troughs, together with a piece of calcined chalk for them to lick, and thus preserve them in health); especial care must be taken to supply her with turnips; or, in case these
roots cannot be procured, beside turning her into a good
warm pasture, she should be fed with brewer's grains, to
which may be added a little hay, oats or bran; but, as the
last-mentioned articles are greatly inferior to turnips, it be-
comes an object of importance to obtain a supply of those
useful roots.

The ewes ought to be conducted to the lambs three or
four times in the day, at nearly equidistant periods; and if
any one have a more than ordinary flow of milk, she may
be held by the head, while another lamb, which has a less
quantity, draws the udder. During the whole of the treat-
ment, the strictest attention ought to be paid to cleanliness;
to promote which, the pens or stalls should be well littered
with fresh straw; and, by this simple expedient, the animals
will, if kept free from all disturbance, speedily fatten, their
flesh being exceedingly white and delicate. Some estimate may
be formed of the profit, arising from rearing house-lambs,
from the prices given per quarter, in the London markets.
These vary from ten to fifteen, or twenty shilling, according
to the demand, so that each lamb sells at from two to four
pounds; though the prices afterwards gradually decline, till
the ensuing spring affords an abundant supply for the table.

SECTION VIII.

Of the Hog.

Among the various articles of live stock, few are more pro-
fitable to the breeder than swine, while the number kept on
a farm is proportioned to the quantity of offal on the pre-
mises; especially as the attendance they require is, when
compared with that of others, very trifling, and the benefit,
arising from their dung, more than counterbalances the ex-
pense of such attendance.
OF THE HOG.

The characteristic marks of a good hog are, a moderate length, as to the carcase in general; the head and cheek being plump and full, and the neck thick and short; bone fine; quarters full; the carcase thick and full; his bristly hide fine and thin; the symmetry or proportion of the whole well adapted to the respective breed or varieties; and, above all, a kindly disposition to fatten early.

On account of the numerous sorts and varieties of these animals, found in almost every county, it is scarcely possible to ascertain which are the original breeds; in the table prefixed to this work, it is attempted to arrange those which are of most frequent occurrence, and are held in the greatest estimation.

Swine are capable of propagation at eight or nine months; but the boar should be at least twelve months before he is admitted to the sow, which will farrow a stronger and better litter, if she be kept to the same age. The period of gestation is from seventeen to twenty weeks; when from five to ten, or more pigs, are produced: one boar should not be allowed to serve more than ten sows; and those sows are reckoned the best for breeding strong pigs which have about ten or twelve paps.

Where swine are kept solely for the purpose of breeding, it is necessary to pay the same attention to the principle of selection as in other articles of live stock. Hence, whatever sort may be required, the boar and sow should respectively be chosen with as perfect symmetry and other requisites as are practicable; and also be as well kept, in order to produce the necessary stimulus to coition: and, having attained this object, the stock should be constantly raised from such animals.

Farther, as sows will produce two litters in the year, the breeder will find it beneficial so to arrange each time of farrowing, that it may take place about the latter end of March or early in April, and towards the beginning or end
of August: thus he will be enabled to rear them with less cost, and certainly with less probability of losing the pigs from cold weather, than if they were produced late in autumn: and, while the sows are in pig, they will require to be kept on nutritious food, in order that they may afford the pigs a better nourishment.

It sometimes happens, at the first farrowing, that young sows will eat their progeny; to prevent which, they should not only be narrowly watched, as the period of gestation is expiring, but also be particularly well fed, two or three days before the expected time of farrowing. Where, however, this precaution has been omitted, it has been recommended to wash the backs of newly farrowed pigs with a sponge, dipped in a lukewarm infusion of aloes and water, which will prevent her from destroying them. Another circumstance worthy of notice, where there are several sows farrowing at the same time, is to confine them in separate pens or sties, otherwise they will mutually destroy their offspring; and, as these animals are, at such time, extremely mischievous, let them be supplied with plenty of water, which expedient is said to prevent them from committing any injury.

The best time for killing sucking pigs, for the market, is at the end of three weeks; by which time the others, intended to be raised, will be able to follow the sow, and then the males may be safely castrated; the spaying of females may be deferred for another week.

When it is proposed to wean pigs, they should be fed at intervals, during the sow's absence, with the best milk that can be spared from the dairy; this should at first be lukewarm, but, afterwards, may be given cold; and, at the end of three weeks or a month, they may either be fed alone, or may be permitted to run with their dam abroad.

In the management of swine, of whatever breed or variety they may be, it will be proper to have them well-ring-
ed, to prevent them from breaking into corn fields during harvest; and that operation ought to be performed as early as possible.

Lastly, sows may be allowed to breed till they are six years old; and a boar to serve them till he has past his fifth year: after that time, the former may be spayed, and put up to fatten, and the latter may be castrated, as he is then no longer fit for generation, though his flesh will make excellent bacon. Throughout the management of these animals, the strictest regard to cleanliness should be observed; for, notwithstanding they are, when left to themselves, proverbially filthy, it is certain that they will uniformly thrive better, and more speedily, if the sties are kept clean and well littered with straw; the expense of which will be more than compensated by the value of their dung; which, as well as every other species of filth, ought carefully to be removed.

Having thus specified the chief articles connected with the breeding of these animals*, we shall mention a few hints, which may contribute to guard the unsuspecting purchaser against imposition, in buying and selling swine at markets, both in a fat and a lean state. In the former case, it appears, from actual and repeated experiments, that every twenty pounds of live weight will, when killed, produce from twelve to fourteen clear weight. Where the hogs do not exceed twelve stone, of fourteen pound to the stone, the weight will be twelve pound; if they be of a larger size, it will be, upon an average, about fourteen pounds; so that, if a farmer or breeder weigh his beasts while alive, he will be enabled to ascertain the net profitable weight when dead; and likewise, by weighing the hogs every week, to fix the best time for disposing of them to advantage: because, as soon

* The best modes of feeding and fattening of swine will be discussed infra.—Chap. III. Sect. V.
as an animal ceases to acquire that daily increase which makes it beneficial, the best step that can be followed is to sell, or slaughter him without further delay.

With regard to the buying of hogs in a lean state, the most certain criterion, by which any judgment can be formed, is by weight; and, therefore, is a few lean pigs, of the same size as those intended to be purchased, be previously weighed, a standard will be obtained, which will enable the purchaser to decide with some precision, and, consequently, to offer a proper price in the market.
According to the manner in which husbandmen usually acquire possession of farms, it rarely happens that they have it in their power to place, or to erect, a farm-house in such a situation, and with such offices, as convenience and other circumstances may require. Where, however, a farmer has, either by descent or purchase, a farm at command, or the old mansion is so much decayed that a new dwelling is preferable to making any repairs, it will be highly necessary first to consider the expence of the improvements proposed; this, indeed, is various, in proportion to the value or rental of the farm, and may be computed to require one or two year's rent, where the farm is let for 60l. or 70l. a year, exclusive of the dwelling-house. In cases where the annual rent is from 300l. to 400l. it has been estimated that one year's rent will, upon an average, be amply sufficient for a mansion; and in farms of greater extent, 500l. are allowed for this purpose; and 1000l. or 1200l. for the requisite offices*.

* These calculations are of a general nature, and of course must necessarily vary, according to existing circumstances. The inquisitive reader will meet with numerous useful estimates of farm-building, in the first volume of "Communications to the Board of Agriculture."
The other objects necessary to be attended to in erecting farm houses are, a *salubrious situation* and *convenience*; points of infinite importance, as they materially affect the health and welfare of every individual.

Independently of the general salubrity of the place where farm mansions are proposed to be built, the nature of the *air* and *water* require particular notice; the former should be pure and temperate, the latter wholesome and easily obtained. The most healthy spot, therefore, ought to be selected for building the house, which, where choice of situation can be commanded, should be as nearly in the centre of the farm as circumstances will allow, and be exposed neither to the summer heats, nor to the rage of the winds and storms that prevail during winter. Many parts of our fertile island abound with rivulets and streams, which, however, are rarely regarded, though attention to this point is of the greatest importance. Hence a gentle elevation will be found greatly to conduce to the advantage of the farm house, as well as to convenience of carriage; and where a quick flowing stream has a clean channel and dry banks, it will considerably add to the beauty and salubrity of the place.

With respect to the situation of the house, as it regards proximity to the various offices, it has been laid down as a general rule, uniformly, to select the three most exposed sides of a square for these, while the southern aspect is left open to admit the sun and air. Where, however, a farm house is unavoidably to be built in the vicinity of streams, which are overrun with weeds, or other strong grass, affording a secure shelter to every kind of filth, it will be advisable to choose a northern aspect; for, the north winds blowing more briskly than those from the south, the air is in general cool, putrefaction is checked, fewer noxious vapours will arise, and these will be speedily dispersed by reason of the greater density of the air.
Farther, where convenience and other circumstances will admit, it will be best to erect the house at a small distance from the respective offices, and so to arrange the rooms commonly occupied for sitting, or working, as to command a view of the business carrying on both in the house and abroad.

The following circumstances are stated by Mr. Young, as being essential in planning a farm-house.

I. The kitchen ought not to be a thoroughfare, nor should any house-door open directly into it. The scullery ought to be as near it as possible, but without opening into it.

II. The mistress's store-room should have a square opening into the kitchen, (with a sliding door), on a level with the dresser, or broad shelf that surrounds the store-room, through which she may give out whatever is wanted, to prevent the necessity of frequently passing by a circuitous way.

III. The common keeping or sitting room, ought to open on one side into the store-room, and on the other into a passage leading directly to the cellar, which should be at a small distance, in order that the eye may attend what the hand need not perform.

IV. The window of the keeping-room should look full upon the grand avenue to the yards, cattle, &c. and, if possible, at a safe distance, full into the farm-yard.

V. The farmer should have a store-room, as well as his wife, for sacks, small tools, nails, &c.

In plate I. fig. 1, we have given a plan of the ground-floor of a farm-house, which, on reference, will be found nearly to correspond with these rules of Mr. Young. With regard to the arrangement of the upper apartments,
much will depend upon the fancy or wishes of the builder; let it, therefore, suffice to state, that the farmer's bed-chamber should be placed in an eastern exposure, with a large window facing full to that quarter, in order that the rays of the morning sun may early enter it; and every attention ought to be paid to keep the servants' apartments well ventilated, as a considerable portion of unwholesome air must be evolved from numerous persons sleeping in the same chamber, a circumstance that cannot be avoided in farms of considerable extent.

Before we proceed to discuss the various offices essential to a grass or dairy farm, it will be proper to annex a few hints on the time best calculated for building, as well as on the most useful way of covering the roofs of farm-houses.

For the first of these purposes, the month of April is preferable, especially where masonry work is requisite; for there is no point in building more necessary to be attended to, than that of finishing at as early a period of the summer as possible, in order that the mortar may have sufficient time to dry before the approach of winter. An exception, however, may be made with regard to the farm-yard and offices, which, where repairs are wanted, cannot be done too soon, as they rank among profitable improvements.

The roofs of farm-houses are, for the most part, thatched with straw; instead, however, of adopting this mode, it would be greatly desirable that they should be uniformly covered with slate, or tiles, in all situations where these articles can be procured. But where neither slate nor tiles can be obtained, heath or ling, as it is sometimes called, is preferable both for farm-houses and for out-houses. This vegetable, when well laid on by a judicious thatcher, is superior to straw; and at the same time so cheap, that, in any place situated in the vicinity of
heaths, or wild commons, it may be had for the mere la-
bour of carting it to the premises.

SECTION II.

Farm-Offices.

No article of rural economy is of greater importance than
the judicious disposition of the offices, or out-buildings,
necessary to the successful management of a farm; yet
there is, perhaps, less consideration bestowed on this point
than on any other. It is obvious, however, to the most
common observer, that the size of the various out-houses
ought to be regulated by the extent of the farm to which
they belong, and also by that branch of husbandry which
is more particularly carried on. In a grazing or dairy
farm, indeed, there are fewer offices requisite than in any
other department of agriculture; but it is, nevertheless,
highly necessary to have distinct buildings for the various
sorts of cattle; and the whole of these should be so distri-
buted, as to facilitate the labour and convenience of the
servants. Of the principle offices requisite to a farm of
this description, we now proceed to give an outline, re-
ferring the reader to Plate I. for a general view of their ar-
rangement.

§ 1. Ox-Stalls, or Feeding-Houses.

The structure of these buildings is very simple: of
those used in the extensive grazing districts of Lincoln-
shire, (where they are usually denominated mistles,) Fig. 2
of Plate I. will exhibit a tolerable idea; it is, however, re-
quise that each interval, or stall, should not only be
provided with a trough, or crib, for dry food, but there
should also be, in the centre of each, a vessel, or trough,
for the reception of water, which salutary fluid may be conducted into them by means of tubes leading from the pump, if this be contiguous; and through which it may be poured from buckets, &c. where that convenience does not exist.

In order to erect feeding-houses, or ox-stalls, to advantage, great attention should be bestowed on their situation, which ought to lie dry, and not be exposed too much to the sun, or to the heat of the weather. It will be advisable to lay the floors in a gently sloping direction, with proper drains for carrying off the urine, and also for the more easy removal of dung and other filth. The floors are variously paved: by some it has been recommended to have the pavement of stone, pitched; but the least expensive method is, to lay the floor with Dutch bricks, or clinkers, as they are sometimes called, and which are usually employed for flooring or paving stables. The doors also should be so hung as to open outward, by which means a waste of room will be prevented, and the sheds will be rendered more secure against intruders. Their safety will also be greatly increased by hanging them with a fall to the catch; and, to prevent them from receiving any injury by the weather, when open, they should also have a fall backward, under the eaves of the building. This desirable object may be effected by placing the balance-point in the midway between the two extreme positions of the door, which, being set at a right angle to the line of the building, has a fall to either hand*.

The width of stalls is various: for two middle-sized Devonshire working oxen, Mr. Marshall conceives seven feet to be sufficient, and nine feet for those of a larger size. Cows, though in general smaller than oxen, require equal, if not more room, for the conveniency of milking them, as

FARM-OFFICES.

well as of suckling their calves. Much caution is necess-
ary in constructing stalls, that they be not made too wide,
lest the cattle turn round in them; and thus the stronger
beasts will have an opportunity of injuring their weaker
fellows. But this danger may be avoided by placing a
post in the middle of the stall, immediately before the
shoulders of the cattle, in a line with the front posts of the
*partial partitions*; in which place a post may be found
useful, to fasten calves to while suckling.

The health of cattle being a circumstance of the greatest
importance, especially where the system of stall-feeding is
adopted on a large scale, it will be necessary that there be
a regular temperature maintained, as the confined respira-
tion of many animals must necessarily tend to generate
diseases. Hence, though a loft may be built over the stalls
for the reception of provender, &c. it will be advisable to
construct latticed windows, or apertures, at a considerable
distance from the ground, at the gable ends of the feeding-
houses, and to supply them with shutters, which may be
closed or withdrawn as the season of the year, or the tempe-
trature of the weather, may render this necessary. Farther,
where it is practicable, such openings should be towards
the north or east, in order that they may derive some bene-
fit from the genial rays of the morning sun, and from the
cooler air of the day in summer; beside which, the large
front doors may sometimes be set open during the winter,
in order to admit the sun, or warmer air.

Notwithstanding the obvious utility of free ventilation
in feeding-houses, there are not wanting instances of per-
sons who recommend a contrary practice; and, singular as
it may seem, assert, that the tendency of animals to become
fat is materially promoted by *sweating* them. This mode

* "Midland Economy," vol. i, p. 33.
of treating cattle has been tried on an extensive scale, by Mr. Moody, a spirited breeder of this island, who avers, that the hotter cattle are kept the better they will fatten. He, therefore, shuts them up in a feeding-house, into which no air is allowed to enter for some time. In consequence of the heated breath of so many beasts, a most profuse perspiration is produced; and when this is at its highest point, they fatten most speedily. After thus sweating for about a fortnight, the pile, or hair, falls off, and is replaced by a fresh coat, after which the animals sweat no more; those cattle, however, which do not sensibly perspire, seldom grow fat.

As in every building convenience is a primary object of consideration, so in farm-offices in particular this point demands minute attention. In addition to the cow-house, feeding-house, or mistle, as ox-houses are variously termed, the following plan of a similar building, much used in the county of Roxburgh, in North Britain, may not improperly be annexed.

The feeding-byre here delineated is sixty feet in length, by eighteen in width, and is capable of containing twenty cattle standing across the house, with their hinder parts towards each other; while a sufficient interval is left between them for storing up turnips, or other winter food.
represent four spaces for the cattle, five being allotted to each, and which may be fitted up either with cribs or with stone troughs. B B designate two spaces for receiving roots, each interval being eight feet wide; they are separated from the troughs, or cribs, by means of a strong wooden partition, (for which a thin party-wall is sometimes substituted) from three to three feet and a half in height. D D, the doors are sufficiently wide to admit a cart to be backed in, and turned up; over this low partition the turnips, or other roots, are thrown to the beasts. C C C are passages, four feet in breadth, behind the animals, for the purpose of removing dung and filth by means of the doors, which are respectively marked E E E. Should a particular situation require, or render it convenient, the large doors just noticed may be disposed in the back of the feeding-byre, or ox-house.

Although the plan above delineated is calculated for twenty beasts, it may be adopted with equal ease where ten, or even a smaller number, are kept; for, on the supposition that five feeding cattle are placed on one side, and a similar number of young beasts, or milch kine, are arranged on the opposite side, the green tops of turnips may be thrown on one side to the young animals, while the roots are cast on the opposite side to those which are fattening.

Beside the regular feeding-houses, whose plan and construction have been thus briefly detailed, it will be greatly conducive to the grazier’s interest, to have the roofs of these buildings project forward, on the back front, to such a length, (such roofing being supported, at the extremities, by strong wooden posts, or pillars,) as to afford a kind of open sheds for the use of store cattle, into which they can withdraw from the straw-yard, during the summer heats. The beasts may be respectively separated in the same manner as in cow-houses, a similar interval being allowed for
each, and the floor being also-laid on a gentle descent, not only for the convenient removal of urine and excrement, but also for the ease and comfort of the cattle.

§ 2. Stable.

In constructing stables, as in feeding-houses, the principal object is the situation, which should, therefore, be on an airy, healthy spot, not exposed to putrid or noisome exhalations, and on dry, hard ground. The walls ought to be of a moderate thickness, and supplied with casements on the eastern and northern sides, not only for the admission of air, but also to receive the benefit of the rising sun. Shutters should, at the same time, be furnished for the purpose of excluding the light, if necessary, during the day-time.

Few objects are less attended to in building stables, than the arrangement and formation of the mangers and racks. These, according to the common practice, are needlessly extended across the upper end of the stall; thus much provender, by being drawn down and trodden under foot, is consequently wasted.

This inconvenience is not peculiar to the stables of Britain; it equally prevails in America, where two spirited farmers, of Philadelphia county, have contrived stalls that not only prevent the unnecessary consumption of food, but also contribute wholly to preserve horses from the dangerous consequences arising from hay-seeds falling into their eyes and ears.

The first of these which claim our attention are the racks of Mr. William West's stalls: they are upright, and the perpendicular falls on the inner edge of the trough below, which has a shelving leaf, as delineated in the annexed figures, A representing the elevation of the stall, while a transverse section of the same is delineated at B.
When a beast pulls out the hay, some will fall on the leaf, and thus slide down into the trough, where it is secured from the breath of the animal. The distance between the bottom of the rack and the trough is sufficient to permit the animals' heads to enter, in order that they may get at the dropped hay. The racks are two feet four inches deep, and two feet at the top, from the edge of the rack; they are planed within, so that the hay falls to the bottom of the rack, in proportion as it diminishes in quantity, and the cattle are saved the pain of a long reach, which they are obliged to make in the stables built after the common way. It should be observed, that Mr. West feeds from the entry, which is six feet in width; and that the hay is dropped through a trap-door from the store above.

Equally useful and economical, in the article of food, are the racks of Mr. J. Cooper's stalls, the construction of which the following delineation will explain.
Fig. 1 is an elevation, and fig. 2 represents a transverse section of Mr. C's stall. The benefit to be derived from it is very great, as the upright slats prevent the horses from wasting the hay, as well as from blowing on it. By this contrivance the animals are prevented from looking round, a habit to which horses are much accustomed when any person enters the stable; neither can they thrust their heads over the whole trough, as the slats compel them to feed directly before them.

With respect to the paving of stables, it will be advisable to cover the part on which the horses are to lie down with oak boards, disposed transversely upon a level; and these ought to be pierced with numerous holes, for conducting the urine from the stall-drain into the common, or main drain. The other part should be paved with small stones, sloping about an inch and a half, or two inches, towards the perforated boards; and the adjacent wall ought to be lined with a wainscot of sound and well-seasoned oak.

The width of the stalls is necessarily regulated by the number of cattle intended to be kept; where a stable is
intended to receive many horses, each stall should be of a sufficient width (four feet and a half, or five feet, at the least,) to enable them to lie down, or turn round without inconvenience; at the same time it will be requisite to elevate the divisions near the head, so that strange horses can neither smell, see, nor molest each other. Throughout the whole course of the stable-management the utmost cleanliness must be rigorously attended to, in order to preserve these useful animals in perfect health; hence the farmer will find it greatly conducive to the ease and regularity of this branch of economy, to appropriate some part of the loft, or room above, for the reception of corn; the distribution of which may be greatly facilitated by means of a hopper, or tube, communicating with the manger by means of an aperture; and also to provide a convenient part of the stable for keeping the necessary gear, or harness.

Lastly, as the efforts of the industrious farmer to preserve his stalls in a proper state of cleanliness are sometimes frustrated by vicious animals discharging their stale and excrements into the manger, we shall conclude this article with a concise account of an expedient successfully employed by Mr. Morgan, an enlightened agriculturist of the Western Hemisphere. For this purpose, his stalls have a fixed iron-chain, by way of a halter, which is fastened to a standard, mortised into the front sile of the manger and the joist above. It is composed of two parts: one of these has sixteen links, and is two feet in length, measuring from the staple; the other, which contains twenty-six links, measures about thirty-nine inches, and serves as a collar. At one end of this collar-chain there is a ring, about one inch in diameter, and at the opposite extremity a key, three or four inches in length, having a hole at its middle, by which it is joined to, and freely plays in, the last link. The first chain, which by one end is fixed to the manger, is by the other linked into a middle link of e
the collar-chain, and thus forms two arms, which, being thrown round the neck of the beast, and the key being thrust through the ring and placed at a bar across it, makes a very secure fastening.

§ 3. Barn.

In those farms where corn husbandry is chiefly practised, barns become essential articles; where, however, dairying, or cattle-grazing, prevails, they are of less moment; and, perhaps, every advantage that can be derived from these buildings may be obtained by constructing a chamber-barn, or large chamber, with ventilators and a strong oak floor over stables. But in case it is necessary to erect new barns, care should be taken to make the floors dry and firm, for which purpose oaken planks are preferable to any other material. There should also be a sufficient number of apertures, through which hay, &c. may be housed; and thus many of the inconveniences will be avoided, which must otherwise result from drawing loaded vehicles into the barn.

The following plan of a barn, which is one of the most advantageous hitherto submitted to the inspection of agriculturists, was drawn up by Mr. Young, for the use of the late General Washington, who had requested him to furnish the draught of a barn, and the necessary out buildings for a farm of 500 acres.

The inner width of the barn is twenty-seven feet square, on each side of the threshing-floor; the porch is eleven feet four inches by twelve feet three inches; the threshing-floor thirty-nine feet by twenty on its upper end, and twelve feet and a half at the small door of the porch, which is six feet and a half in width; the great door, at which the carts enter with grain, is fourteen feet nine inches; the sheds for cattle, on the longitudinal sides of the bays, are twenty-seven feet by twelve; the mangers are two feet
broad, out of which the cattle eat their food; the passages for carrying straw from the threshing-floor to feed the cattle are between two and three feet wide, each passage has a door; there are four principal posts to each shed, beside the smaller ones, and gutters for conveying the urine to four cisterns, whence it is every day thrown upon dunghills placed at a convenient distance; from the mangers to the gutters there is a sloping pavement of bricks, laid so as to terminate six inches perpendicular above the gutters; this pavement is six feet broad from that edge to the manger, and the gutters are from eighteen to twenty inches in breadth. At each of the four corners of the threshing-floor there are four sheds for various uses, and at each end of the barn there are two yards with a shed, to be applied to any purpose wanted; one for sheep, surrounded with low racks, and the other divided for a horse or two, loose if necessary; the other half is for yearling calves, which thrive better in the farm-yard than when stalled. The yards just mentioned are inclosed by walling, or by pales. The main body of the barn rises fourteen, sixteen, or twenty feet, to the eaves. Against the walling are various sheds for the reception of cattle. If the number of cattle intended to be kept be greater than here admitted, a circular shed may be erected fronting the small door of the porch, and the hay-stacks be conveniently arranged near the sheds appropriated for cows, horses, or fat cattle.

§ 4. Cart-house and Tool-house.

Among the smaller buildings incident to a farm, a house for the reception of the tools and implements, when not actually employed, is not the least worthy of notice; though it not unfrequently happens, that such instruments are heedlessly left on the spot where they are last used. And, as these consist chiefly of wood-work, the building allotted for this
purpose ought to be so contrived, as to afford a secure shelter from rain, while the implements are thoroughly exposed to the ventilation of air. Hence an open spot, free to every wind, should be selected for this purpose: the roof ought to be supported on pillars, and the sides similar to those of drying-houses, at bleach-fields, with moveable boards for admitting air and excluding rain. An open space, of about three feet, may be left towards the bottom, as at that depth the rain cannot penetrate so as to be productive of any injury. Previously, however, to depositing any implement in this place, it ought to be carefully cleaned and dried*.

§ 5. Calf-Pens.

In some parts of this country, it is the practic to appropriate part of the cow or feeding house to the reception of calves; a measure which cannot fail of producing uneasiness among the cows, which often withhold their milk in consequence of the bleating of the young animals. Hence it is obviously preferable to have the pens at such a distance from the feeding house, that the cows cannot hear them.

The construction of these buildings is very simple: fig. 4, Plate I. will convey a sufficiently clear idea of the most useful mode of erecting calf-pens. \(a\) \(a\) represent two spaces, one of which may serve as a door, the other as a window or a door, according to the option of the farmer, or as convenience may require. \(b\) a passage situated between the respective pens. \(c\) \(c\) \(c\) \(c\) \(c\) \(c\) \&c. the various pens, exhibiting the different partitions which are retained in their respective positions by means of four pins inserted in holes at \(d\) \(d\) \(d\) \(d\) for that purpose; and \(e\) \(e\) \(e\) \(e\) \&c. are the vessels, or troughs, in which the young animals receive their milk.

† Kaimes' "Gentleman Farmer," p. 56.
A moderate, and rather cool, temperature ought, at all
times, to be kept in calf-pens, as well as the strictest
cleanliness observed, and every attention paid to keep them
dry and sweet.

§ 6. The Piggery.

When the profit arising from the rearing of swine is
duly considered, and there is an opportunity of carrying
on this branch of rural economy to any extent, it will be
admitted, that the establishment of a piggery demands even
more attention than that of a dairy, combining as it does
with more objects. A piggery, in the opinion of Mr. A.
Young, must be in a circle, or it must fail in conven-
nience; according to his idea, in the centre there should
be the boiling or steaming house, with a granary for corn,
meal, &c. Around this a range of cisterns ought to be
disposed, in divisions, for receiving immediately from the
copper, or steam apparatus, and also by tubes from the
granary. Around these should run a path, then a fence or
paling, in which are the troughs, with hanging lids, for sup-
plying food directly from the cisterns, on one side, and for
hogs feeding on the other; a range of yards next, and another
of cow-sheds beyond, and last of all the receptacle for the
dung. The potatoe stores, or pyes, should at one end point
near to the entrance, and water must be raised to the coppers
and cisterns at once by a pump; a trough, or other con-
voyance from the dairy to the cisterns, for milk, whey,
&c. An arrangement like this, he conceives, would be
very convenient, while the expence attending it would be
inconsiderable; and great profit might be derived, by set-
ting apart a plot of natural or artificial grasses, into which
the swine might be turned at pleasure. "Those," he adds,
"who do not possess a convenient pig apparatus, can have
little idea of the great use of it in making manure. This
alone becomes an object, that would justify any good farmer in going to a certain expence, for attaining so profitable a part of what ought to be his farm-yard system."

By means of a yard constructed on this plan, Mr. Young fattened eighty-eight hogs in the spring of 1766, with the attendance of only one man; whereas, three would have been inadequate to the task without such conveniences. The total expence of such a yard now, he thinks, would not be less than 150l. and, if it were constructed according to the more correct idea, the cost would amount to 200l. or 250l.; but the governing idea of position should be followed in a stie of 20l.

This plan, however, is obviously calculated only for those farms where the fattening of swine is carried on upon an extensive scale. Where these animals are kept chiefly for domestic consumption, it will be sufficient if hog-sties be constructed with due regard to warmth and dryness, and divided into various partitions for the reception of swine, according to their age, varieties, &c. Each division should be between six and seven feet in width, of such a height as the beasts can conveniently enter, and with thatched, or tiled, shed roofs, as convenience or other circumstances may require. Each partition should be kept clean and well littered, and should be provided with a small space sufficiently capacious for holding the feeding-troughs, so that the swine may be conveniently fed without unnecessarily going in among them. The troughs may be so arranged, that offal; milk, &c. may be conveyed into them from the milk-house, or scalding-house, by means of pipes; and as these animals often thrust their feet into the troughs, and thus waste a considerable portion of food, this waste may be avoided by fixing sticks in a frame over the troughs, not unlike a rack; or a thin piece of plank may be nailed on the back part of the troughs, and so project as to allow their heads only to enter. This object may
also be obtained, especially where swine are put up to fatten on dry food, by fixing a conical hopper (holding any given quantity) in a trough, with the broad end upwards; at the lower end should be an aperture for giving out the meat into the trough, or wooden receiver, where the animal may eat it as it falls, without being capable of spoiling or wasting any portion of it. The top of the hopper ought to be about two feet and a half square, and provided with a strong lid, or fastening, so that the beasts cannot force it open. By adopting the expedient here suggested, a considerable advantage will be derived in fattening swine, viz. that, though the animals will not perceptibly increase so fast as in the common mode of giving them food, yet their fat will be more firm and of a better flavour, while it will be less liable to become rusty, qualities which must evidently contribute to the profit and reputation of the breeder.

Beside the various buildings above specified, it will also be proper to have stalls of similar construction with those already described, for the reception of sick or diseased cattle, which should be erected in some spot contiguous to the farm-offices, but at such a distance as to prevent the healthy beasts from being affected by the contagion.

§ 7. Straw and Root-houses.

The utility of these buildings, on those farms, where the stacking of hay and straw is not adopted, is very great; as much time is saved in carrying hay and straw to cattle, perhaps from a considerable distance, and often with much waste. Where, however, stacks are employed, it will be advisable to convert the hay or straw house into a store-room for roots, and to supply it with a root-steamer, for the purpose of preparing such vegetables for the use of the cattle. This simple machine, in fact, is indispensably ne-
cessary on all farms, where the feeding of cattle is conducted to any extent.

The apparatus here delineated consists of a brick or stone stove, about three feet in every direction, in which is fixed a pot or kettle, half a foot or eight inches deep, and eighteen or twenty inches in diameter. Over this boiler (when about half full of water) is placed a hogshead, or cask, the bottom of which is perforated with numerous holes, about one inch in diameter, so that the steam may freely pass through the roots. In America, whence this contrivance was introduced into England, the top of the cask is usually left open, which might more advantageously be covered with a thick coarse cloth; or, which is better, (and is practised by Mr. Wakefield, in the vicinity of Liverpool,) after the vessel is filled with the washed roots, it is closely clayed all round, and the head fastened down to confine the steam; and, if necessary, a short wooden plug may be inserted for the purpose of admitting air, and which may be removed at pleasure. When sufficiently steamed, the roots may be removed by means of a shovel, or by turning the cask over; and, thus prepared, they
afford a more invigorating food to cattle than if they are given in a raw state.

§ 8. Water.

There is no article of greater importance to the health of animal life than a constant supply of water, which, being the only liquid cattle are accustomed to drink, ought, therefore, to be perfectly pure. Good water is indicated by limpidity and clearness, by continuing transparent notwithstanding alkalies or other chemical tests, and by passing easily through the intestines. But its relative salubrity necessarily depends on the peculiar properties it possesses, and on the various mineral substances through which it passes. Thus, spring water and that obtained from wells are most wholesome, when they have undergone a perfect filtration through sandy soils; and as the fluid usually consumed in farms is derived chiefly from these means, we propose, in the present section, to state a few of the most approved modes of preserving, or disposing of it to advantage.

Wells are the most frequent contrivances, occurring on farms, for supplying water: their structure, indeed, is not immediately connected with the nature of the present work; but the following method of obtaining water, in almost every situation, is so simple, that we cannot but think its insertion will be of some advantage, particularly in those districts which are not remarkable for an abundant supply of that necessary fluid. This expedient was devised by M. Cadet de Vaux, an intelligent chemist, of Paris, who directs the soil to be perforated with an augur, or borer; a cylindrical wooden pipe is then to be placed in the hole, and driven downward with a mallet, and the boring is to be continued, that the pipe may be forced down to a greater depth. As the borer becomes filled with earth, it should be drawn up and cleared; and, by adding fresh portions of pipe, the
boring may be carried to a great extent under ground, so that water will thus, in most cases, be obtained. Wells made in this manner are superior to those constructed in the common mode, not only in point of cheapness, but also by affording a more certain and abundant supply, while no accident can happen to the workmen so employed. In case the water near the surface should not be of a good quality, the perforation may be continued to a greater depth, till a fluid of a purer kind can be obtained; and, where wells have already become tainted from any circumstance, or accident, if they be previously emptied, and the bottom perforated in a similar manner, so as to reach the lower sheet of water; this, being in the cylindrical tube, will rise in a pure state into the body of the pump fixed for this purpose.

In Plate I, fig. 5, is delineated an arrangement for distributing water in a farm-yard, invented by Mr. J. Cooper, an intelligent American farmer. His contrivance is excellent; for, by the disposition of his spouts and fences, he is enabled to water four different kinds of beasts at the same time, as is obvious, on referring to the figure already cited.

But beside the convenience of having a supply of water at hand for domestic uses, as also for the consumption of the farm-yard, it is equally necessary to have, in the fields, one or more drinking ponds, as the extent of the farm may require.

The situation best calculated for making ponds is at the bottom of a gentle declivity, (where that can be obtained), and in the corners where two or more fields meet together; by which means a regular supply of water will not only be procured after rain has fallen, but also the cattle can be watered with less waste of time and of ground. Clayey soils are mostly selected for this purpose; but as these are liable to crack and become leaky from perfora-
tions by worms, and also from the evaporation of the water by intense heat, various expedients have been invented to prevent these inconveniences, and render ponds watertight.

In making ponds, the pit ought first to be dug to a convenient depth: for those of 120 feet in circumference, or forty feet in diameter, five feet is a sufficient depth, which may be enlarged to seven if the pond be 180 feet in circumference, or sixty feet in diameter; and if the situation will allow a reservoir to be constructed for the reception of the waste water, on the upper side of the main reservoirs, that portion of the water which is intended for the use of cattle will be preserved in a greater state of purity, while the sediment that will, from time to time, be collected in such reservoirs, may be easily drawn out thence, and converted into an excellent manure. Farther, from these reservoirs an additional advantage might be derived, particularly if they lie in the vicinity of a town where there is a demand for fish, by stocking them with the last-mentioned animals, which would also afford an agreeable variety of food for domestic consumption. Lastly, the sides of the ponds should be carefully sloped to an angle of about forty or forty-five degrees, so as to admit the cattle with most convenience to them, and with little or no detriment to the bottom of the ponds.

Having thus stated a few preliminary circumstances necessary to be attended to in constructing ponds, we proceed to notice the most useful of the cements suggested for rendering them perfectly retentive of water, without requiring the aid of masonry work.

While the cavity is digging, let a sufficient quantity of moist, brick clay be incorporated with one-fourth part of quick-lime, (which should be slacked, the evening before it is used, with such a quantity of water as will make it of the consistence of cream cheese), and the whole be formed
into balls of eight feet in diameter, or about two feet in circumference. After the pit is finished, and a proper supply of these balls is obtained, the labourer is to descend into the cavity, where a ball is thrown to him; this must be thrown on the ground with all his strength, as nearly into the centre as possible. Successive masses, or balls, are placed in such a manner, that every one comes in contact with that which follows it, until the bottom and sides are completely lined. In case the whole of this operation cannot be finished in one day, it will be necessary to moisten the row last applied in the evening, in order that it may adhere to, and incorporate with such as remain to be laid on. Two or three days after this lining is completed, it must be beaten with a flat piece of wood, which labour should be continued with greater strength in proportion as the firmness increases; and the surface ought occasionally to be moistened, to prevent it from cracking, till the whole becomes a uniformly solid mass. A coating of any cheap oil is then to be applied, on which a stratum of gravel, (about one inch in thickness), should be laid, before the pond is filled with water. Thus the coating will become remarkably firm and solid, and require no repairs, provided the pond be kept constantly full; as those parts of the work only, which are exposed to the air, are liable to be damaged by intense frost*; but this inconvenience we think may be avoided, if a scarcity of water be apprehended, by collecting and heaping large quantities of snow upon them, the first winter after the ponds are completed.

In the annexed engraving is delineated an outline of a pond for soils where there is a scarcity of water, of which description there are many in the county of York, where they were introduced about thirty or thirty-five years since.

* Journal de Physique, vol. i.
AN ARTIFICIAL POND
FOR DRY SOILS.

The line A represents a circular hole made in the ground, of such dimensions as circumstances may require; on this a stratum of clay, B, must be carefully beaten and trodden till it become a solid, compact mass, from four to six inches in depth. The line C describes a layer of quick-lime, about an inch, or an inch and a half in thickness, which should also be uniformly spread over the whole. D is a second stratum, or bed of clay, which ought likewise to be from four to six inches in depth, and be beaten and trodden down in a similar manner. The letter E designates stones or gravel, either of which minerals must be spread on the second bed of clay, to such a thickness as will prevent the pond from being poached, or injured by the feet of cattle, and consequently save the water from being discharged through the pores of the earth. F delineates the line of level both of the ground and of the water; and when thus finished, the pond will be about five feet deep, and forty-five in diameter, the usual dimensions of these useful reservoirs in Yorkshire. The expence of constructing ponds, of the size above specified, are stated* to be from four to six pounds sterling, accord-

ing to the distance whence the clay is carted; and reservoirs thus formed will remain unimpaired for many years, as the lime prevents worms from striking either upwards or downwards, and of course from damaging the clay.

§ 9. The Dunghill.

The importance of dung, as a manure, for the various departments of agriculture, is too obvious to require any proof in support of this remark; but, as much of its utility depends on the manner in which it is managed in the farm-yard, we conceive it will not be altogether irrelevant here to give a few hints on the best mode of forming and tending the dunghill.

For this purpose it is the usual practice to dig a pit, sufficiently deep to contain the stock of dung which the farm can produce, or the farmer can procure. Into this cavity are thrown the waste fodder, dung, refuse of litter, weeds, and other substances, which lie there and rot till the manure is wanted. The following plan, however, which was suggested by the late Dr. Darwin, is certainly preferable, both for convenience and for retaining the waste water, urine, &c. that would otherwise prevent the fermentation, and consequent putrefaction of straw. He proposes to form a heap of dung, or manure, on a gentle declivity, with a basin at the bottom of it, for draining off superfluous moisture; and, if some earth, leaves, weeds, sawdust, or other vegetable or animal refuse be thrown into this basin, it will facilitate the putrefaction of the substances it contains, while the draining from the dung-heap will not be dissipated. But, as the continual accession of liquor in the basin must, in the course of time, soften the earth which forms its bottom and sides, and thus much valuable compost be probably lost, it would be of essential benefit in preserving the liquor, if the bottom and sides of the pit were covered, first, with a hot mortar, consisting of lime and
pounded gravel; after which a cement, prepared in the following manner, may be applied. Let equal parts of pounded brick, sand, and sifted stone-lime be thoroughly incorporated with hot lime-wash, and be spread on the surfaces as hot as possible; and to prevent the cement from cooling and becoming a solid mass, it will be advisable to make only a gallon, or such other quantity as may be laid on at one time, before the heat can evaporate.

In the county of Middlesex, the subsequent judicious mode is adopted in forming dunghills, or dung-meers, as they are sometimes called. First, the scrapings of roads, the mud collected from ponds and ditches, and the top mould of gravel pits, are spread in the most convenient places, as bases or bottoms for dunghills. On these beds are carted all the manure produced on the farm, as well as what can be procured from the different inns occurring on the road, and also from the metropolis; together with the occasional addition of ashes, soap-boilers' waste, builders' rubbish, chalk, and other vegetable and animal recrement. In this state the heap continues, till within a month of the time for manuring the soil; the whole is then turned and mixed intimately together, and the larger pieces, or clods, are broken into smaller lumps, while those which may be too dry are thrown into the middle. By this treatment the whole mass is united more perfectly, and the fertilizing fluid that oozes from the dung during the fermentation which necessarily ensues, is effectually preserved, and greatly conduces to improve the land.*

The most proper situations for dunghills are contiguous to the stables and ox-stalls, to which another may be added, near the house and piggery. They may be tended and augmented at odd times, when no other business, requiring

* Middleton's Agricultural Report of the County of Middlesex, 8vo.
particular attention, stands in the way. The dung-meat adjacent to the house, especially, may be easily composed of various rich and fertilizing ingredients besides dung. Thus the scrapings of the yard, after rain has fallen, may be advantageously thrown in; as also may some of the nearest earth, swamp mud, straw, weeds, the dung of fowls, soot, and ashes; shells, lime, and bones; the sweepings of the kitchen; oil dregs and any fatty matters; woollen rags; bloody water, in which meat or fish has been washed; greasy water; suds; ashes, even when the ley has been extracted from them; old useless brine; urine; and, in short, any animal or vegetable substance that does not contain too much acid; though even acids may be employed, if their properties be counteracted or overbalanced with abundance of alkaline substances.

In order to prevent the heaps from being too much torn or spread about by swine, or by the scratching of fowls, they may be usefully included in pens, made with wide boards; or, they may be walled to the height of two or three feet above the surface of the ground.

The dung heaps, contiguous to the barn or cow-houses, may be augmented with some of the nearest soil, mud, weeds, &c.; but, in every case, it will be proper that those ingredients predominate in each heap, which are best calculated to ameliorate the land on which it is to be laid. Hence it will be necessary to acquire a knowledge of the nature of the various manures; but, as this subject will be discussed in a subsequent chapter*, we shall conclude this article with observing, that, if the waste liquor be thrown from time to time over the heap, it will contribute to increase the fertilizing properties of the dung; but, in wet seasons, it will be necessary to throw some slight shed over the heaps, as too great a degree of moisture will retard the fermentation. That process,

* Chap. VI. Sect. III.
however, will not take place so rapidly as it ought, unless the heaps are shovelled over once or twice, in the course of the summer; by such operations, the various ingredients will be more intimately mixed and mellowed, and consequently, the sooner fit for use; while the seeds of weeds therein will vegetate, and be destroyed.

§ 10. The Kitchen Garden.

A good, well-calculated kitchen-garden is an important appendage to a farm, as it contributes greatly to diminish the expence of house-keeping: it ought to be situated either on the back or side of the house, so that manure may be conveniently carried thither, and a proper regard should be paid to proportion the paths or walks to the size of the ground, as much soil will otherwise be wasted, which might be more beneficially employed. It would far exceed the limits of this work, to enter more into the detail of a kitchen-garden, the arrangement and culture of which must, in all cases, be regulated by the wants or caprice of the owner or occupier; let it therefore suffice to say, that particular care should be taken to fence it securely; so that neither swine nor poultry can enter, or injure its productions.
CHAP. III.

ON THE FEEDING AND FATTENING OF CATTLE.

SECTION I.

Of the Pasture and other Food best calculated for Cows, as it respects their milk.

As the nature of the grass, or other vegetables, has a very considerable influence both on the quality and on the quantity of milk which cows produce, the attention of the industrious farmer will, of course, be directed to this point; for, as instances have occurred, where six milch kine, fed on some pastures, have yielded as much milk as nine, or even a dozen, will afford on an inferior ground, it is obviously his interest to have his cows well fed and in good condition, rather than to keep up a particular number, without heed- ing whether they are properly supplied or not. Hence, as we have already observed, it will be proper to suit the milch cows to the nature and fertility of the soil; and, on no account, to purchase them from pastures superior to those destined for their reception.

The feeding of milch kine is divided into two branches, viz. pasturing and house feeding.

In order to obtain an abundant supply of good milk, where the pasturing of cows is adopted, they ought uniformly to be well fed; for this purpose, grass growing spontaneously on good, sound meadow land is, in general, deemed the most proper food. Another requisite is, that the grass be plentifully produced, and of that quality which
PASTURE FOR MILCH COWS.

is relished by the cattle. With such view, it has been found very beneficial to pasture cows on a field of grass, consisting of a mixture of Dutch clover and a little rye grass, or of equal parts of Dutch and white clover, intermixed with a small quantity of rye grass. In Scotland, a mixture of common goose-grass* and white clover is said to make one of the best kinds of pasture, of natural growth, of any in that country; and it is asserted, that cows will milk pretty well, when fed upon a pasture of this description, provided it be properly sheltered, and situated low; because such pastures are warmer than those which are elevated much above the level of the sea.

Much attention, however, is necessary, in order to eradicate the crow-garlic, sauce-alone, or garlic-hedge-mustard, (which is also known by the provincial names of Jack-by-the-hedge, or garlic-wormwood), and similar vegetables; which, when eaten by cows, uniformly impart a rank flavour to their milk, and consequently to the butter which is made from it. And, as that fluid often becomes bitter, as well as liable to turn at the fall of the leaf, it will also be proper to prevent them, if possible, from eating decayed leaves, by collecting them. It is likewise worthy of note, that though the long, rank grass, growing in orchards, or other places, in general feeds well, and produces a flush of milk, yet such milk will neither be so rich, nor carry so much cream, in proportion, as the milk of those cows which are fed upon short, fine grass; nor, of course, will their butter be so good. Hence much attention and judgment must be directed to this point.

Farther, the quality and quantity of milk is materially affected by driving them to a distance from one pasture to another; hence it will be proper, as we have already intimated, to have the cow sheds in as central a part of the

* The *galium aparine* of Linnaeus; it is also called cleavers, or elivers.
farm as possible. Beside this circumstance, it is of essential importance to have pastures well sheltered and inclosed, as the produce of milch kine will be greatly improved, or irritated, according to the attention or disregard bestowed on this point; for, when cattle are confined within proper inclosures, they not only feed more leisurely and without much labour or disturbance, but are also less liable to receive injury by being beaten, pelted with stones, or worried by dogs, which is inevitably the case where they wander into other fields, and consequently the owner must incur a considerable loss in the produce and quality of their milk.

With regard to the housing of milch kine during summer, the general practice is, where there are proper inclosures, to send them out in the evening, in order that they may lie out during the warm season. The advantages hence resulting are as follow: by breathing a purer atmosphere, they are less susceptible of the vicissitudes of heat and cold, while they are left to eat grass at liberty, whether early or late; and, it is asserted, that they yield more and better milk than if they were confined in a house.

In the winter, however, milch kine are usually fed in houses on cut hay and straw; though, where the practice of keeping them in stalls does not prevail, it will be proper to have warm sheltered yards, furnished with open sheds, in which they can feed without exposure to the severities of the weather; a measure, of which the expence will be more than counterbalanced by the increased quantity of milk which they will yield.

In the management of milch kine, it is essential that they be, at all times, kept in high health and good condition; for, if they are suffered to fall in flesh during the winter, it will be impossible to expect an abundant supply of milk by bringing them into high condition in the summer. Hence, if cows are lean when calving, no subsequent management can bring them to yield, for that season,
any thing like the quantity they would have furnished, in case they had been kept throughout the winter in good condition. During that inclement season, therefore, the most nutritious food should be provided for them, and the animals be kept in warm stables; for beasts will not eat so much when kept warm, as when they are shivering with cold; and if they be curried in the same manner, and kept as cleanly as horses in a stable, the happiest consequences will ensue, both in regard to the milk they yield, and the rapid improvement of the cows themselves; but this treatment is, probably, not capable of being employed to advantage where numerous cows are kept. Pure water is a more essential article to cows, which, if well supplied with that necessary fluid, kept clean, and laid dry, will produce milk more copiously, and afford a quantity of rich manure that will amply repay the trouble and attention thus bestowed on them. Dr. Anderson, indeed, (whose labours in behalf of useful science are too well known to require commendation), has stated, that he knew a man who attained to great opulence by attending to these circumstances, and particularly to the important one of having a continued supply of the purest water that could be procured for his milch kine; nor would he, on any account, permit a single animal to set a foot into it, or suffer it to be tainted even by the breath of beasts.

It has already been intimated, that the best summer food for cows is good grass, spontaneously growing on sound meadows, as their winter food usually is hay. When, however, other green food cannot be obtained, the tops or tenderest twigs of the common furze, (gorse or whins, as the plant is variously called), may be bruised and given

* Dr. Anderson's "Recreations in Agriculture and Gardening," vol. iii.
† Baron d'Alton, in "Communications to the Board of Agriculture," vol. i.
to them; in fact, this vegetable is, in the opinion of Dr. A., greatly superior to common fodder, as it increases their milk without imparting any unpleasant flavour to it. They are cut at Michaelmas, will continue till Christmas, and be fit for use till March. Other excellent additions to hay for winter food are *parsnips* and *carrots*, which roots not only render the milk richer, but also communicate to the butter made from such milk a fine saffron colour, equal to that produced by cows feeding on the most luxuriant grasses:—

the *mangel-wurzel*, or root of scarcity, which, on the continent, is preferred to every other vegetable for feeding cattle in general:—*potatoes*†, on which cows will thrive well, so that with one bushel of these roots, together with a little soft meadow hay, they will yield as large a quantity of sweet milk, or butter, as they usually afford when fed on the finest pastures:—*cabbages* are, likewise, of eminent service in this respect, but they require to be given with a good portion of fine hay:—to these may be added *burnet*, the utility of which is too well known to require any particular detail here:—*fog*, or grass reserved for winter use, which is cut and carried to the animals:—*spurry*, an useful vegetable, employed to a great extent, for fodder, on the continent, where it is preferred even to grain:—pulverized *oil-cake*, *turnips*, *tares*, *rouen*, and similar succulent food. By the judicious use of these various articles, together with a due admixture of dry food, considerable nutriment is thrown into the system, while regular secretions will be excited, and the quality of the milk very materially improved.

The following mode of feeding milch kine is practised, to a great extent, in the county of Middlesex, from which the inhabitants of London chiefly derive their milk. During

* Much benefit, it is ascertained, may be derived by steaming the various roots above mentioned; for a simple apparatus, which is well calculated for this purpose, *vide ante*, Chap. II. Sect. II. p. 88.
the night the cows are confined in stalls, and about three o'clock in the morning each has a half-bushel basket full of grains given to her; when the operation of milking is finished, each receives twice that quantity of turnips, and shortly after one truss of the finest, softest, earliest-made, and greenest meadow hay is divided among ten cows. These various feedings are usually made before eight o'clock in the morning, when the animals are turned into the cow-yard. Four hours after, they are again tied up to their stalls, and supplied with the same allowance of grains as they had received in the morning; on the conclusion of the afternoon milking, (which generally continues till near three o'clock), they are served with a similar quantity of turnips; and, in the course of another hour, with a like allotment of hay. This method of feeding usually continues throughout the turnip season, that is, from September to May; during the remaining months they are fed with grains, tares, cabbages, and the proportion of rouen, or second-cut meadow-hay, already mentioned; and are fed with equal regularity until they are turned out to grass, when they pass the whole of the night in the field; and, even during this season, they are often fed with grains, with which some cow-keepers mix common salt, with a view to preserve them longer in a sweet state. But this practice has much declined, as the proprietors, who tried the experiment, did not meet with an adequate return for their labour and expence*; though it has been asserted, that the

* Middleton's "Agricultural Report for the County of Middlesex," 8vo. This intelligent reporter farther states, that brewers' grains may be preserved, in a sound state, from March till Summer, when brewing is discontinued, by tightly treading them down in pits below the surface of the ground, and covering them with a layer of earth, in order to exclude the air and prevent fermentation. Such vats, or pits, now are, or lately were, to be seen at Rhodes', the cow-keeper, near Kingsland Road; and also at Islington.
mixing of salt with the food of cows (which will eat it with great avidity) both increases the quantity and improves the quality of the milk, while it contributes to promote the health of milch kine.

In the course of the preceding statements, the *stall-feeding*, or *house-feeding*, of cows during the winter has been mentioned; and, from the remarks of Baron d’Alton*, it appears, that this method of feeding may be adopted throughout the year with greater profit than can be obtained from pasturing. The benefits capable of being derived from *stall-feeding* are, indeed, very great, but as this mode is equally applicable to the feeding and fattening of neat cattle in general, (which will be discussed in a subsequent page), the reader is referred to the following section, where its advantages are fully detailed. At present, therefore, we shall only remark, that independently of the additional supply of rich manure, thus attainable, a considerable saving will be made in the consumption, or waste, of food by the common practice; particularly in those situations where lucern, sainfoin, clover, and cichory can be abundantly commanded; which succulent vegetables, however, will require to be mingled with hay, straw, or similar dry food, in order to promote the regular secretions of the animals. Baron A. indeed says, that cows must be early trained to the confinement of *stall-feeding*, otherwise they do not thrive; but we understand, from an intelligent correspondent in Philadelphia, that this opinion does not hold in every respect; for he was informed by a friend, that while the British troops occupied Philadelphia, during the American contest, he *confined a cow upwards of twelve months in his stable;* and that, by feeding her on good hay, and occasional messes of short, wet feed, with the usual attention to cleanliness, he preserved the animal in health, and obtained an abundant supply of milk. It must, however, be

* *Communications to the Board of Agriculture, vol. i.*
admitted, that all cows may not thrive equally well, if penned up; but as the advantages of soiling and stall-feeding are so great, there can be no difficulty in adopting and executing it, where it is intended to keep calves of a particular breed, for they may be easily reconciled to the confinement*.

SECTION II.

Of the feeding and fattening neat Cattle; including a comparative View of the Advantages resulting from Grazing, Soiling, and Stall-feeding.

The feeding and fattening of cattle, whether for labour or for sale, is the most important in the whole economy of the grass-farm; hence the farmer should previously consider the nature and fertility of his pastures, and the extent and quality of his other resources; and, according to these, he ought to regulate his system of grazing, soiling, or stall-feeding; selecting, in the first instance, those beasts only which evince the most thriving disposition to fatten with the least consumption of food, and depasturing them upon such lands as are best calculated for the respective breeds; and especially taking care, (as already intimated), not to bring cattle from rich to inferior soils, but, wherever it is practicable, to chuse them from lands of nearly the same quality as those destined for their reception; beside which precautions it will be necessary, in all situations which are not provided with wholesome water, to avoid selecting

* The object is, of this section, chiefly to point out the best mode of applying vegetables to the feeding of cows; as the peculiar advantages of each, together with their culture, will be specified in a future chapter, it did not appear necessary to enlarge particularly on that subject in the present section. Vide infra, Chap. VII.
cattle from those districts where that fluid abounds in a state of purity.

The synoptical table of breeds prefixed to this work will probably supply some hints, for enabling the farmer to decide what sort of stock is calculated for peculiar situations; in addition to those remarks, we would observe, generally, from the practice of the most eminent graziers, that the larger beasts are preferable for the more luxuriant pastures; while, in such as are less rich, small stock answer best. Thus it is remarked, by an able correspondent, in Mr. Young's "Annals of Agriculture," (vol. xxxii), that a grazier, who has fine and fertile pastures, may select his beasts as large as he can find them; provided they are of the right sort and shape. He, however, recommends shape to be always preferred to size, as this will pay them better; and, it is requisite, that those who are upon indifferent grass take care to proportion the size of their beasts to the goodness of their pasture; for it is preferable to have cattle rather too small than too large, because there are numerous tracts of ground which will be profitable for grazing such cattle, which are not capable of supporting large breeds. Hence we find, that in the rich grazing counties of Lincolnshire, Sussex, &c. large breeds are chosen, with a mixture (in the former county) of Scotch and other cattle, bred in the vicinity. In the counties of Norfolk and Suffolk the kiloes and galloways are fattened preferably to any other breeds, on account of their superior kindness and the excellence of their flesh, which uniformly procure a ready sale in the London markets. Next to these, in the esteem of salesmen, is the dark red variety of the Devonshire sort, which chiefly prevails in the counties of Leicester, Oxford, Somerset, and Warwick; to these may be added the Glamorgan, Hereford, and Suffolk polled breeds of cattle, all of which are eminently profitable in particular situations. In order to carry on the grazing of cattle with effect, it is
necessary that the grazier form a complete plan, or system, and proceed regularly therein, deviating from it in those instances only which obviously tend to improve his course, and ultimately to increase his profits.

With regard to the species of cattle best calculated for grazing, spayed heifers and oxen* are certainly superior to any other stock; the former, indeed, are of less frequent occurrence, though they fatten with more expedition. But oxen are more commonly and justly preferred, as they may not only be moderately worked for a series of years, but also, when very old, their flesh makes excellent beef†. Wintering heifers in calf, in some grazing districts termed in-calvers, may also be advantageously fattened, if attention be paid to selection, and the beasts are well fed, during winter, on rich succulent crops; they are occasionally sold for small sums at the autumnal or Michaelmas fairs, and may be disposed of in the succeeding spring, with the calves running by their side, to considerable profit. Free martins, or barren cows, have also been tried for the pur-

* Neat cattle are known by various appellations, according to their age and sex; which, as such terms may probably often appear in the course of the present work, it may not be amiss here to state. "Thus the bull, while sucking, is called a bull-calf; when turned of a year old, he is a stirk, or yearling bull; after that, a two, three, four, or five years old bull, until six, after which he is deemed aged. When castrated he is termed, for the first year, an ox, or stot-calf; then a stirk, stot, or yearling; for the two following years he is a two or three years old steer; and, at four, he receives the name of bullock, (which has of late years been extended to denote fatting cattle in general). The name of the female neat cattle is, for the first year, a cow-calf; then a yearling quey, heifer, or twinter; the next year, a three year old quey, or Leifer; at four a cow, which name continues; if spayed, she is termed a spayed, or cut heifer; or spayed or cut quey, in the northern parts of this island." Culley on Live Stock, p. 17, 18. 3d Edit.

† For a comparative view of the excellence and utility of oxen, vide infra, Chap. I. Sect. V.
pose of fattening, but they rarely succeed; this is also the case with old cows, and such as are become dry, which may, in a few instances, prove a source of profit; but as they are for the most part hazardous, and much inferior to young or middle-aged stock, (which are always to be selected, if possible, from their kindliness to fatten,) it will be proper that such cows take the bull before they are turned into the pastures; and that they be constantly ready for sale, at least three months before the time of gestation expires.

It has been intimated, that young, or middle-sized, cattle are preferable for the purpose of grazing: they are certainly best calculated for the gradual mode of grazing, the duration of which varies from a year and a half to two years; and, by the manure they afford, as well as the enlarged price they fetch when sold, they amply repay the expense of their keep. In stocking lands with cattle, the proportion of beasts to be introduced must depend upon the fertility of the soil, as well as upon local custom, and other circumstances. In the counties of Somerset and Devon, one acre, or one acre and a half of the richer kinds of land, are allotted to one ox, to which a sheep is sometimes added; but, fertile as those districts are, they are surpassed by the richer grounds of Lincolnshire, the best of which will support one ox and fourteen large sheep on two acres during the whole summer, and five sheep on a similar space of land in the winter, or sixteen sheep on one acre throughout the summer. And instances have occurred, in which one hundred and ten Lincolnshire sheep, and fifteen large bullocks of the same breed, have been fattened on fifteen acres, the last-mentioned animals having been put to spring grass out of the straw-yard, and fattened to the enormous weight of 1130 pounds by the ensuing Michaelmas.

In order to graze cattle to advantage, it ought to be a fundamental principle so to stock them that they may feed without restraint; beside which, as often as opportunity or
other circumstances will allow, it will be profitable to change them from one pasture to another. By this expedient, as cattle delight in variety, they will cull the uppermost, or choicest part of the grass, and by filling themselves quickly, as well as by lying down much, they will rapidly advance towards the proper state of fatness; while the grass, which is thus left, may be fed off with labouring cattle, and lastly with sheep. Hence it will be advisable to have several inclosures, well fenced and sheltered, and abundantly supplied with wholesome water. Respecting the best size for such inclosures, there is a difference of opinion; from ten to fifteen or twenty acres, perhaps, is the most appropriate; though, if any be of a greater extent than this, they may be divided by a strong but temporary fence for this purpose. Their size, however, should be various, as small ones are preferable in winter, and larger ones during the summer. Thus the greatest and strongest cattle will be separated from the weaker ones; for, if cattle of various sizes are indiscriminately mingled together, the more powerful beasts will master the others, driving them from place to place, and trampling upon or wasting more food than they can eat.

To prevent these inconveniences, some intelligent graziers recommend the following method of feeding and fattening cattle. Suppose there are four inclosures, each consisting of from six to ten acres each, one of such inclosures ought to be kept perfectly free from stock till the grass is in its full growth, when the prime or fattening cattle should be put into it, that they may get the best food; the second best should then follow, and the young stock after all, making the whole feed over the four inclosures in the following succession:

*First inclosure.* Free from stock, till ready for the best cattle.
Second inclosure. For the reception of the best cattle, till sent to No. 1.

Third inclosure. For the second best cattle, till sent to No. 2.

Fourth inclosure. For the young cattle, till sent to No. 3.

Thus the fourth inclosure is kept free from stock till the grass is got up, and it is ready for the prime cattle.

Farther: it will be of service to erect *rubbing-posts* in different parts of the various inclosures, where stock are feeding or *teathing*. This practice originated in the county of Norfolk, whence it deserves to be more generally known and adopted, as such posts keep the cattle from the fences, and, as Mr. Marshall observes, "furnish them, no doubt, with an agreeable, and perhaps a salutary amusement." He also remarks, that some Norfolk farmers draw the crown of a tree, with the lower part of the boughs left on it, into the middle of the close; this is less trouble than putting down a post, is easily rolled out of the way of the plough, and seems to be still more agreeable to the cattle.

Before we proceed to discuss the other branches connected with the grazing of cattle, we trust it will not be altogether irrelevant to state a few particulars concerning the peculiar practice, or management, of some of the most eminent graziers.

Thus some farmers purchase *heifers* in the month of March or April, these are kept throughout the summer till October or November, when they are disposed of. In peculiar situations, this method is capable of being adopted with profit; but it is inferior, in point of advantage, to the practice of those graziers who buy in lean cattle in the month of May, and turn them in upon the meadows and pastures as early as possible. Here the beasts become com-

OF FEEDING NEAT CATTLE.

pletely fat on the grass-feed towards the close of October, or the commencement of November, or even later in the year, according to their kindliness of disposition in taking on fat. This mode is very beneficial, particularly with small cattle, as these can be turned into the less fertile lands, which would not afford an adequate supply of food to the larger sorts of beasts. In the county of Middlesex, the method just mentioned is applied with uncommon success, on luxuriant hay-farms. The graziers in that county purchase small cattle, which are in pretty good condition as early in the autumnal quarter as the rouen latter-math, or after-grass, is ready; into this the beasts are turned, and are sold to considerable advantage about the end of October, or early in the ensuing month of November.

There is another mode practised in some grazing districts, where the lean stock are purchased at various periods and of different sizes, so that they may be sent to market in April or May, when such beasts are generally sold for considerable sums. According to the plan of these graziers, the cattle are sometimes kept throughout two winters, during the first of which they are not at full keep, but in the following summer they are turned into good grass, and are fattened off in the second winter with the best and most forcing food the farmer possesses. The more common system, however, consists in buying small cattle as early in the spring as the grass affords a good bite, when they are allowed one summer's grass, and are stall-fattened in the ensuing winter; but these two methods are too expensive to be generally adopted, and, in fact, can only be practised with effect on the richest grass lands.

With regard to the management of pasture grounds, it may be observed, that those which are laid, or allowed, to rest at Candlemas, may be grazed in the following May; such as are laid in May may be grazed at Midsummer; those to which rest is given at that season, may be grazed at
Lammas; while such as are laid at Lammas may be grazed in October, and generally throughout the succeeding winter.

In the grazing of cattle, a variety of circumstances will claim the farmer's attention, in order to conduct his business with regularity or with profit. Hence he ought to take especial care not to turn his stock out into the pastures in the spring, before there is a full bite, or the grass has obtained a sufficient degree of length and maturity; for neat cattle, whose tongues chiefly enable them to collect their food, neither can nor will bite near the ground unless they are compelled by extreme hunger, in which case, it is obvious, they cannot enjoy their feed, and consequently cannot thrive in proportion.

Further: where beasts are turned into fields, consisting either of clover entirely, or of a mixture of natural and artificial grasses, great circumspection is required, to see that they do not eat so eagerly, or to such excess, as to become blown, or hoven, an affection to which cows are more peculiarly liable than any other neat cattle. That disorder, however, may be prevented, either by feeding the animals so as to gratify the cravings of appetite before they are turned into the pasture, or by constantly moving them about the field for a few hours after they have been turned in, that the first ball at least may sink into their maw before the next be deposited. Should they, notwithstanding, be attacked with that dangerous swelling, they may be relieved by adopting the remedies pointed out, infra, Chap. IV. Sect. I.

Grass usually attains its acme of maturity and luxuriance about midsummer; and from that time to Lammas it possesses a peculiar sweetness, so that stock may be allowed, during the intervening period, to bite somewhat nearer to the ground. It will, however, be necessary to remove fattening cattle, (as already intimated), from time to time, into fresh grounds; so that by taking the uppermost and choicest
part of the grass, they may feed both expeditiously and thoroughly. The grass left behind them may be fed off first with labouring cattle; and afterwards with sheep. This last-mentioned point cannot be too minutely regarded; for, if cattle be in want, they will lose more flesh in one day than they can possibly gain, or recover, in three. Hence those meadows, or pastures, (particularly such as lie in fenny or other situations, which retain moisture for a long time), ought to be fed off as early as possible, lest sudden or long-continued rains descend, which will not only render the juices of the grass thin and watery, and ultimately putrescent, but which will also materially affect the health and constitution of the animals, and not unfrequently occasions that consumptive (and often epidemic) disease, the rot. To prevent the losses consequent on such accidents, it will therefore be indispensably necessary, daily and attentively to inspect the grazing stock; and, if any beasts appear to be affected by eating wet grass, they should be immediately conducted into dry shelters, and fed with hay or straw; though, if no shelter be conveniently at hand, they must be driven to the driest spot, and there supplied with sweet cut grass and dry fodder.

The hard or light stocking of pasture ground is a point on which many experienced graziers are by no means agreed. By some it is contended, that pastures ought to be stocked very lightly; alleging, that although much of the produce is thus allowed to run to seed, which the cattle will not eat, and which is consequently trodden under foot, where it is rotted by rain, and thus wasted; yet experience, say the advocates for light stocking, evinces that a greater profit will, upon the whole, be thence derived than by any other practice, on account of the superior thriving of the animals.

By others, on the contrary, it is maintained, that the practice of light stocking is highly to be condemned; be-
cause it not only tends gradually to diminish its produce, but also to encourage the growth of coarse and unprofitable grasses, which materially deteriorate the pastures; and that the hard stocking of grass lands, particularly those of a rich quality, is an indispensable requisite of good management. It must be confessed, that the superior fertility of the hard-stocked Lincolnshire pastures tends greatly to corroborate these assertions; but it is recommended by a third party, (whose opinion, perhaps, approximates more nearly to the truth), that mixed stock should be always kept on the same field; and, if the consumption of the foul grass, produced by the dung of the animals, were the only article to be adverted to, it might, doubtless, be so managed as to correct this evil; though it must be admitted, that there is such a variety of circumstances to be attended to, that even this expedient will not remedy them all.

In every field, numerous plants spontaneously spring up, some of which are disliked by one class of animals, while they are eaten by others; and some of which plants, though eaten with avidity at a particular period of their growth, are entirely rejected by the same beasts at another period of their age. Hence it becomes necessary, not only to have a great variety of cattle in the same pasture, but also a very particular attention is required to augment or diminish the proportions of some of these classes of animals at certain periods of the year; otherwise some part of the produce will run to waste, unless indeed it be hard stocked to such a degree as to retard their thriving.

Where, however, a great variety of animals is allowed to go at large in the same pasture, they rarely feed with that tranquillity which is necessary to ensure thriving; it frequently happens, that one class or sort of beasts wishes to feed or to play, while others are inclined to rest. Thus they mutually tease and disturb each other: and this inconvenience is materially augmented, if any sort of penning, or confine-
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ment, be attempted. Hence it is obvious, that the practice of intermixing various kinds of live stock is productive of evils, which are, in many instances, greater than those resulting from the waste of food intended to be prevented by this practice. There is, indeed, no doubt but that by hard stocking the grass will be kept short, and will consequently be more palatable in general to the animals that eat it, than if it were allowed to grow to a great length; and that even unpleasant patches may thus be consumed; but as animals, which are to be fattened, must not only have sweet food, but also an abundant bite at all times, in order to bring them forward in a kindly manner; it appears scarcely possible to unite both these advantages in such practice.

Independently of remedying the inconveniences above specified, a variety of circumstances concur to prove, that the practice of soiling, or feeding, cattle during the summer with different green and succulent vegetables, which are cut and carried to them; and of stall-feeding them in the winter season with dry fodder, in conjunction with various nutritive roots, will in general be highly economical. The former of these modes, in particular, has been but little used till within a few years, and has not been treated with that attention which its importance deserves: hence, we trust, it will neither be inconsistent with the nature of the present work, nor altogether uninteresting to those who are sedulously aiming at the improvement of their lands, if we consider the subjects of soiling and stall-feeding in the following points of view.

I. By introducing the practice of soiling, a greater variety of plants will be consumed, and consequently prevented from running to waste. If, indeed, the consumption of plants be the object principally regarded, it is obvious, that the benefits thence to be derived will be very great; for experience has clearly proved, that cattle will
eat with avidity many plants, if cut and given to them in the house, which they never would touch while growing in the field: such are the dock, cow-parsley, thistles, nettles, and numerous other plants. We confess, we know not to what circumstance this can be attributed; but the fact is, that the animals will eat them without exhibiting any marks of dislike or reluctance, even when they are not pressed by hunger; and they often greedily devour these plants, as soon as they are brought in from the field, and before they can have possibly had time to become hungry. There are even vegetables which, in a green state, are poisons to cattle; but which, when cut and dried into hay or fodder, may not only be given with impunity, but are also eaten with avidity. Such, for instance, is the water crowfoot* with which (according to the statement of Dr. Pulteney †,) the cottagers in the vicinity of Ringwood, on the banks of the Avon, almost entirely support their cattle: and so eagerly do these animals consume it, that they deem it unsafe to allow them more than a certain quantity. Cows, indeed, are asserted to be so peculiarly fond of that vegetable, (which keeps them in good milking condition), that, exclusive of the scanty pittance they obtained on an adjacent heath, five cows and one horse did not consume more than half a ton of hay in the course of a year. Thus, it is evident, that fewer plants will either be rejected or suffered to waste.

Farther, it is well known that many of the best and finest grasses, which, when young, form a most palatable food to cattle, are, if once suffered to get into ear, so much disliked by them, that the beasts will never taste them unless compelled by extreme hunger. And as, in most pastures, many of these grasses get into ear from various causes, their produce is of course inevitably lost to the grazier; whereas, if cut down by the scythe in proper

* The Ranunculus aquatilis of Linnaeus.
† "Transactions of the Linnean Society," vol. v.
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time, not one plant will be suffered to get into that nauseating state, and consequently no waste can be sustained from this cause.

Besides, when animals are suffered to go upon the field, many plants are necessarily trodden under foot and bruised, or partly buried in the earth; in which state they are greatly disrelished by cattle, and are suffered to run to waste; a circumstance which never could occur, if the practice of cutting were adopted.

In addition to the preceding observations it may be remarked, that those few plants which are totally disregarded by one class of animals, so as to be rejected by them, even in the house, will not, on that account, become less acceptable to others, but greatly the reverse. Thus grass, or other food, that has been blown or breathed upon by any animal for a considerable time, becomes unpleasant to other beasts of the same species, but not so to stock of another class or variety; for them, indeed, it appears to acquire a higher relish. Even greater defilement by one animal seems to render food more acceptable to others; for straw, which in a clean state has been refused by cattle, if employed as a litter for horses, acquires for the former such a relish that they seek for it with avidity. Hence it happens, that the sweepings of the stalls from one animal supplies a pleasing repast for those of another kind, which can be easily removed from one to the other, if the plants are consumed in the house, but which must otherwise have been lost in the field. And this peculiarity may, as we shall shortly have occasion to show, be employed to answer another useful purpose.

II. With regard to the influence produced by soiling and stall-feeding on the health and comfort of cattle, the balance, we conceive, will be clearly in favour of the cutting system, when compared with that of pasturing. Thus, it is well known, that when animals are exposed
to the sun, in the open air, they are not only greatly in-
commode, on many occasions, by the heat, but are also
annoyed by swarms of flies, gnats, and hornets, which, as
well as the terrible gad-fly*, drives them into a state of
perturbation little short of madness, which must obviously
tend to impede their thriving. At other times they are
hurt by chilling blasts, or drenched by cheerless rains,
which (especially in humid situations) not only retard their
feeding, but also occasion that consumptive epidemic, the
rot. Under proper management, in well-constructed stalls,
all these evils would be alike removed, and they would be
kept in a uniform state of coolness, tranquillity, and ease,
so as to make the same quantity of food go farther in
nourishing them than it otherwise could have done. The
cattle will also, by such treatment, be prevented from lick-
ing up worms, snails, slugs, and other noxious creatures
among their food, which is frequently the case by pastu-
ring, when they feed at those times of the day or night
in which these vermin are in motion. This inconvenience
would be entirely avoided, by cutting the grass at such
times as none of those animals are visible; beside which,
numerous lingering diseases may thus be often prevented,
that always impede the thriving of the cattle, and not un-
frequently terminate the existence of the beast. Lastly, by
judiciously mingling green and succulent vegetables with
dry and nourishing food, as circumstances may require it,
in any given proportions, and by varying the different ar-
ticles so as to provoke an appetite; not only the health, but
also the thriving of the creatures will be greatly augmented
beyond what they could have been by any other mode of
treatment.

III. The proportional increase of manure obtained by
soiling and stall-feeding, farther evinces their superiority
over pasturing. Manure is the life and soul of husbandry;

* The *Estrus bovis* of Linnaeus, sometimes called the breeze.
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and, if it is chiefly to be attended to, there can be no comparison between the two modes of consumption, especially with regard to the manure obtained by soiling live stock, during summer, with green food; for, in consequence of the increased discharges of urine during that season, the litter, of whatever substance it may consist, is speedily converted into dung. And there can be no doubt, but that the quantity of manure made during the summer may, by constructing proper reservoirs for the reception of the stale, and by throwing this at leisure times over the litter, (as intimated in a former page), be made to equal, if not exceed, the produce and quality of the dung accumulated during the winter. This circumstance, indeed, is so greatly in favour of soiling and stall-feeding, that we conceive any farther proofs, in confirmation of our remarks, altogether unnecessary.

IV. With regard to the quantity of herbage afforded from the same field, under the cutting or grazing systems, the balance will be found equally in favour of the former. All animals, it is well known, delight more to feed on the young and fresh shoots of grass than on such as are older. Hence it invariably happens, that those patches in pastures which happen to have been once eaten bare, in the beginning of the season, are kept very short throughout the remainder of that season, by the animals preferring them to other parts of the field where the grass is longer; so that the latter are often suffered to continue, in a great measure, untouched throughout the season. Another circumstance, however, which is not very generally known, is, that grass—even the leafy parts of it—when it has attained a certain length, becomes stationary; and, notwithstanding it will retain its verdure in that state for some months, yet it would have continued in a constant state of progress, advancing with a rapidity, in a great measure, proportioned
to the frequency of its being cropped*. But the diminution of produce that must be incurred, has not, to the best of our information, been adverted to by those who are most interested in it; nor do these important facts in rural economy appear to have entered into their consideration. We are however convinced, from actual experiment, that the actual produce of the same field, by a judicious management in this respect, compared with bad management, may be augmented fourfold in the same season. Thus, instead of one acre and one third (the usual proportion of pasturage allotted in England to one head) the fourth part will be fully adequate to the support of a beast during the six warmer months. Farther, an acre of middling soil should produce 20,000 pounds weight of green, or 5,000 pounds of dry clover. A large cow requires 110 pounds of green, or 27 pounds of dry clover per diem; consequently, in thirty-six days, she will consume 40,150 pounds, or somewhat more than the produce of two acres: whereas the same beast, if fed entirely out of doors throughout the year, would require a pasture of four acres. The Rev. Mr. Close, one of the ablest agriculturists this island can boast, has shown ("Communications to the Board of Agriculture," vol. iii,) that with clover, grass, lucern, and tares, a treble number of cattle may be supported in much better condition than by pasturing; and from the results of other trials, it appears to be equal to five, six, or even a larger number. But as it would swell this work to a disproportionate size, if we were to enter into farther details of the various successful experiments that have been made in soiling cattle, we refer the reader, who wishes for a more minute account of these, to the fourteenth volume of Mr. Young’s "Annals of Agriculture," which contains

* See Dr. Anderson’s valuable "Essays on Agriculture, &c." vol. ii, disquisition 5, where this interesting fact is corroborated by experimental proofs, which our limits forbid us to introduce.
full and interesting particulars of the extensive trials made by him and Mr. Hutcheson Mure with reference to this subject.

The practice of soiling and stall-feeding cattle has also been adopted, to a considerable extent, on the continent, by Baron de Bulow and others; the result of whose experience is inserted in the first volume of the "Communications to the Board of Agriculture," by Dr. Thaer, which, he observes, has proved the following facts to be incontrovertible.

I. "A spot of ground which, when pastured upon, will yield sufficient food for only one head, will abundantly maintain four head of cattle in the stable, if the vegetables be mowed in proper time, and given to the cattle in proper order.

II. "The stall-feeding yields, at least, double the quantity of manure from the same number of cattle: for the best and most efficacious summer manure is produced in the stable, and carried to the fields at the most proper period of its fermentation; whereas, when spread on the meadow, and exhausted by the air and sun, its power is entirely wasted.

III. "The cattle used to stall-feeding will yield a much greater quantity of milk, and increase faster in weight, when fattening, than when they go into the field.

IV. "They are less subject to accidents, do not suffer by the heat, by flies and insects, are not affected by the baneful fogs that are frequent in Germany, and bring on inflammations; on the contrary, if every thing be properly managed, they remain in a constant state of health and vigour."

The facts and inferences above stated fully prove the advantages of soiling and stall-feeding; but, notwithstanding they are so obvious, there are not wanting persons who object to these practices, that bad seasons will happen, in
which no grass can be cut and carried, on account of heavy rains or cold winds that retard its growth; and consequently, that it will be requisite to have some fields divided off, in which the cattle may find pasturage. To this objection it may be answered, that it will always be found a more safe and profitable plan to keep a quantity of hay in store, to meet the contingencies of unfavourable seasons, and to soil or stall-feed beasts in the manner above recommended, which we have seen practised to a considerable extent in towns where cows are frequently kept on hay and straw throughout the year, and thrive exceedingly well. It ought not, however, to be concealed, that there are some inconveniences attendant on the soiling and stall-feeding of cattle; though, when compared with the disadvantages resulting from other methods, they are trivial. Thus, where large quantities of food are accumulated together for a considerable time, they are liable to fermentation, and of course to waste; such are cabbages, turnips, and other roots; so, where tares are left on the ground they are liable to become podded, in consequence of the butt-ends of the vegetables being of a coarse nature and in a decaying condition, in which state they are uniformly refused by beasts. But these, and many other disadvantages that might be mentioned, may be obviated by paying due regard to the storing of the various vegetable crops, and to the economical consumption of them; which subjects will be discussed in a subsequent chapter. It has likewise been objected, even by persons who in general approve of soiling and stall-feeding, that cattle will, by confinement during the summer months, be too much heated, and that their health will be affected; but surely stalls may be so constructed as to admit a regular circulation of air, and yet shelter them from the attacks of flies. Attention to both these particulars, indeed, is indispensably necessary to the preservation of the health, and the speedy
fattening of animals; for, if kept too hot, they will perspire profusely, and their hides will itch; this vexes them exceedingly, so that they rub themselves violently against any post, or wall, within their reach, which necessarily retards their quick feeding. And, though the practice of currying and combing cannot perhaps be performed where there is much live stock, yet the beasts will greatly improve, if they be washed once at least in the course of the week.

When grass (whether natural or artificial) is to be given, it ought to be cut in the morning for the evening food, and in the afternoon for the morning mess: the afternoon crop should be carried to the barn, or some other convenient place, and spread out in order to exhale its superfluous moisture; and, in rainy weather, both crops must be taken off the ground. Attention, however, ought to be paid to the due proportion to be cut; and, until that fact be ascertained, it has been recommended by Mr. Bordley, an eminent agriculturist and breeder, of the Western Hemisphere, to measure each mess, and to chalk down the quantity, in weight, which the basket, cart-body, or other vehicle employed for carrying food, contains of the various articles used for that purpose. The practice will, at least, have a tendency to teach farm-servants to observe method, the value of which is of considerable importance in all business, particularly in the various branches that are connected with, or dependent on, a grass farm. On the supposition, therefore, that seventy-five pounds weight of green clover will be sufficient for one beast, he observes, that where thirty-two head of cattle are to be fed, 1200 pounds will be cut twice in the day. Eight acres, cut four times in the season of soiling, will give one cutting in six weeks, or nearly thirty perches are cut daily. A man and a boy may perform all the work and pay all the attention requisite in soiling that number.

As the various grasses, peculiarly calculated for grazing
or soiling cattle, will be particularly detailed in a subsequent chapter*, together with the best modes of cultivating and storing them, we proceed now to state a few of those articles which have been found most useful for the purpose of winter or stall-feeding, or of feeding in the farm-yard.

This branch of the grazier's management begins about the end of October, and lasts for about seven months, that is, till the commencement of May. Of all vegetable productions, good hay is undoubtedly the best for fattening cattle, when judiciously combined with straw cut into chaff by proper implements†, and with cabbages, carrots, parsnips, turnips, or similar succulent plants; though such hay, except on the most luxuriant soils, will rarely be found capable of fattening animals without the aid of other food. Barley, rye, oat and pea meal, when mixed together in about equal proportions, with the occasional addition of a small quantity of bean meal, may likewise be given with advantage, in the ratio of a quarter, or at most half a bushel, to each head of cattle, in conjunction with cut hay. Of the last-mentioned article it may be observed, that the hay made from grass mowed after the cattle, is usually employed for feeding live stock at the beginning of winter, the best being reserved for the spring, before the cattle are turned out to grass; and where a handful of salt has been thrown over each load, as packed in the loft, so grateful is this condiment to them, that they have been known to prefer poor hay salted to good hay unsalted.

The most luxuriant of all vegetable productions, perhaps, is the cabbage, with its numerous varieties, which, when combined with cut pea or oat straw, has been found singularly useful as winter fodder for store stock; and

* Chap. VII.

† Vide Chap. V. where descriptions are given of the most useful straw or chaff-cutters, illustrated with engravings.
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which, with the addition of excellent hay, will fatten oxen or bullocks in the short space of five months, beside yielding a larger quantity of manure than almost any other article used for winter feed; though the disagreeable flavour that plant is supposed to impart to milk has been assigned as a reason for disusing it; but such objection may be easily obviated, by steaming them in the contrivance which has already been described, in Chap. II. Sect. II. §7. p. 88. Of parsnips we have spoken in the preceding section; at present, therefore, it remains only to add concerning these useful roots, that they have been employed on the experimental farm of the Marchioness of Salisbury, in the county of Herts, with remarkable success, not only for feeding store cattle, but particularly for fatting oxen, which eat them most advantageously; the benefit thence derived being, in the estimation of some graziers, nearly equal to that obtained from oil-cake (which will be mentioned in a subsequent page). Next to parsnips we may class the carrot; a most useful root, the produce of which is so abundant that, according to the account of Mr. Young, four bullocks, six milch kine, and twenty work-horses were fed, a few years since, at Partington, in Yorkshire, for above five months, with carrots, the produce of three acres, with no other addition than a little hay throughout that period. He adds, that the milk was excellent in point of quality and flavour, and the refuse or waste, with a small quantity of other food, fattened thirty swine.

Turnips, especially when steamed, also supply a nutritious article of winter food; though, from their peculiarly moist nature, they will probably require to be combined with cut hay, to which a little barley or oatmeal may occasionally be added. But these roots, however beneficial in this country as an article of winter feed, have not succeeded in America, where an unfavourable opinion is entertained concerning them; for, an intelligent grazier, in
that country, having a more abundant crop than he could dispose of, determined to feed his cattle with them. The beasts were accordingly put up in October, and were fed till the month of February upon turnips: the animals did not thrive as he expected, on the contrary, they rather lost flesh; though, on substituting hay, chopped potatoes and the meal of Indian corn, they soon fattened. This difference of result, in the use of turnips, can only be accounted for by the supposition that the turnips, containing a superabundance of moisture, produced too much laxity or scouring, and of course prevented the animals from taking on fat kindly.

In the county of Norfolk, however, which has long been celebrated for its turnip husbandry, there are very great numbers of cattle annually fattened for the London market, on little other food than turnips, which are given to them whole, and in a raw state; and it rarely happens that any animal is choked, or otherwise injured, by the roots sticking in the throat. Should this accident, indeed, occur, the practice is to pour a horn full of salt and water down the beast's throat; and in case that does not succeed, Mr. Bayfield, an eminent grazier and farmer of that county, pours down a similar quantity of salt and melted grease, such as hog's lard or any common grease, which preparation (except when it was applied in one instance too late) he has never found to fail of procuring relief to the animal in danger of suffocation.

Mr. Marshall, to whom we are indebted for the preceding circumstance, as well as for the subsequent particulars, conjectures, that warm oil and salt would perhaps have the same effect. Having stated this remedy, which we conceive to be justly deserving the grazier's notice, on account of its cheapness and facility, we now proceed to detail a few of the more striking points of the Norfolk mode of turnip-fattening cattle, which we trust will prove highly interesting.
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The method in question is three fold*:-According to the first plan, the roots are thrown on stubbles, grass lands, and fallows, to cattle abroad in the fields. This is the prevailing practice, the greater part of the cattle fattened in that district being fattened abroad: it requires the least attendance, and is allowed to be beneficial to light lands.

The general practice in the county of Norfolk is, to begin with the wheat stubbles, on which turnips are usually thrown, till they are broken up for fallow or barley. The next throwing-ground is frequently the barley stubbles, which receive the bullocks, (i.e. fattening and fatted cattle,) as the wheat stubbles are scaled in, and retain them until they are, in their turn, broken up for a turnip fallow. From Christmas till early in April, the clover lays only are thrown upon; and after these are shut up, in order to acquire a bite of rye-grass for the unfinished bullocks, the turnip fallows sometimes become the scene of throwing.

Occasionally, however, the farmers deviate from this mode; some objecting to the throwing of turnips on land, intended for those roots the following year, under the apprehension that it produces the disease termed anbury†. In this case the clover lays succeed the wheat stubbles, some part of them being kept open till the turnip crop is finished in the spring. Sometimes young clover fields are thrown open; but this is regarded as bad management, unless the season is remarkably dry, and the surface of the earth is perfectly sound; nor is it often done, unless there happens to be no clover stubble in the vicinity of the turnip piece.

But though the soil of Norfolk is, in general, remarkably dry, the farmers of that district are sometimes incon-

† The nature and probable cause of this affection in turnips will be stated, infra, Chap. VII. Sect. VI. where the culture of these roots is discussed.
venienced, in wet seasons, for clean ground on which to throw their turnips; and, notwithstanding the value of *teathe*, when the land will bear the bullocks, instances have occurred where farmers have requested their neighbours to allow them to throw turnips upon a contiguous piece of old lay-ground, or *olland*, as it is there called; preferring the loss of his teathe to checking his bullocks. On this account, therefore, Mr. Marshall recommends, in laying out a farm upon the Norfolk plan, so to intermix the crops that there shall be, at least, two pieces of lay in the neighbourhood of each piece of turnips.

The turnips are thrown on the land in the following manner: a cart enters on one side of a close, in which stands a boy, who, as the vehicle is going regularly to the other, throws the roots out, with their tops and tails on as they are drawn out of the ground; giving every part an equal share, and never throwing twice in the same place, until the whole has been gone over. In the commencement of the throwing season, while there is yet an abundance of grass for lean stock, the usual practice is, to keep the fatting beasts constantly in the same piece of wheat stubble, a fresh supply of roots being given them every day, or every second day at farthest.

When the clover stubbles are cleared from grass, and the store cattle begin to require assistance from turnips, the fatting cattle have *followers*, i.e. rearing cattle; lean bullocks, cows, or store sheep follow them to pick up their refuse. In this case it becomes convenient to have three shifts, or three pieces of throwing ground in use at the

* "This is an important word in Norfolk husbandry, for which our language has no appropriate synonym: it denotes the fertilizing effect of cattle upon the land, on which they are foddered with any kind of food; whether such fertilizing effects be produced by their dung, their urine, their treading, by their breath, perspiration, and the warmth of their bodies."—Marshall's Norfolk, vol. i, p. 34.
same time; one allotted for the head beasts, another for the followers, and a third plot empty, for the purpose of throwing turnips on it. Two pieces, or at least two divisions of the same piece, are indispensably necessary; and sometimes a row of hurdles is run across a throwing piece, in order to separate the bullocks from the followers.

In throwing turnips, it is of great importance that they be thrown evenly and thinly, so that while a beast is breaking up one root, he cannot have it in his power to trample or dung upon another. But sufficient precaution is seldom taken to guard effectually against this inconvenience, though, if turnips are cast at the distance of one yard asunder, they are not ill thrown, as they are too often dropped in rows, or clusters of half dozens together.

Bullocks, which are on turnips abroad, are sometimes driven into the straw-yard at night, where the distance is not too great; and, occasionally, a little straw is given them under the hedge of the throwing piece, where they continue entirely abroad. The quantity of straw thus consumed is very trifling; the object of it being merely to cleanse their mouths from the dirt of the turnips, on which alone the farmers place all their dependance for bringing their cattle forward.

Mr. M. remarks it as an interesting fact, that not one in ten of the highly-finished bullocks, which are annually sent to Smithfield out of Norfolk, taste a handful of hay, or have scarcely any other food whatever than turnips and barley straw, excepting such as are fattened off in the spring with ray-grass; and a few that are fattened by superior graziers, who make it a point to give a little hay to their bullocks at turnips, towards the spring, when those roots are going off, and before the grass-lays are ready for their reception; an excellent practice, which ought, if possible, to be generally adopted, as without such precaution bullocks are liable to be checked in their progress between
turnips and grass. Instances however have occurred, though rarely, in the county of Essex, in which Northumber-
land beasts, of the largest size, have been fattened on turnips alone, without the aid of any other food.

The second method of giving these roots to cattle is, by means of close bins, or small cribs, with boards or bars nearly close at the bottom, while the beasts are kept in a loose straw-yard. These bins are dispersed over the yard, and the turnips are put into them whole; the tap-root, and also the tops, unless they are fresh and palatable, being previously cut off, so that the fatting animals receive only the bulb; the tops, if eatable, being consumed by store cattle.

While the bullocks are in the yard, they have the straw sometimes given them in cribs, and at others it is scattered in small heaps about the yard, twice or thrice in the day; the quantity thus eaten is very trifling, and with the last-mentioned management, the yard becomes evenly littered without farther trouble.

The mode of fattening here detailed is attended with somewhat more labour than the preceding method of throwing turnips abroad, which, in Mr. Marshall's opinion, is the preferable management, if the soil be sufficiently dry to support stock, and light enough to stand in need of being rendered firm by treading; on the contrary, where the land is deep, and the season is wet or severe, the straw-yard is the more comfortable place, provided it be kept dry and well littered, and be furnished with open sheds, in which the stock can shelter themselves. For, though the teathe of fatting cattle abroad is greatly beneficial to light soils, yet if bullocks, while fed in the yard with turnips, are well littered, they will make a large quantity of excellent manure, that will amply compensate for the additional labour thereby occasioned.

The third method, above referred to, consists in keep-
ing the cattle tied up in hovels, or beneath open sheds, with mangers or troughs for receiving the turnips, which, in this case, are frequently sliced, or more generally (though perhaps less eligibly) cut into quarters by means of a small chopper, upon a narrow board or stool, beneath which is a basket for catching the pieces. In this operation the turnip is held by the top, which, when wholly disengaged from the root (except the coarse part immediately about the crown) is thrown aside for the store cattle. The tap-root and bottom rind are separated with the first stroke, and suffered to fall on one side of the basket, so that the fattening animals have only the prime part of the plant.

Hence arises the quick progress in fattening, which bullocks fed under sheds sometimes make, especially in cold weather; but, from the increased trouble and expense consequent on this practice, though it requires less litter, it is confined chiefly to little farmers, who have opportunity to tend their own sheds. Under this treatment, the beasts have a little barley straw given them occasionally, in order to clean up their mouths, and dry up the superfluous pieces of the turnip.

From the preceding facts and statements, Mr. Marshall conceives an eligible plan of management may be adopted, where circumstances will admit of it. In autumn, therefore, while the weather continues moderate, the bullocks may be allowed to remain abroad; but, whenever it sets in very wet, or becomes intensely severe, they should be taken and kept under shelter, either until their fattening be completed, or the warmth of spring again invites them abroad.

To return from this digressive account of the Norfolk turnip-management, the importance of which, we trust, will be a sufficient apology for its length:—burnet, sainfoin, whins, gorse or furze, lucern, and the mangel-wurzel, or root of scarcity, having been mentioned in the preceding section, it is unnecessary again to point out the benefit to be derived
from them in feeding cattle; hence we shall only remark, that the last-mentioned plant, as well as the common red beet, have lately been found to answer peculiarly well, not only for feeding, but also for fattening cattle; and, from some experiments recently made in the county of Hertford, they are superior to carrots, and nearly equal to parsnips. Fir tops, or the young and tender shoots of fir trees, have likewise been employed with effect in a case of emergency, as a substitute for other articles of winter fodder; of this circumstance we have a striking illustration in the fifth volume of the "Letters and Papers of the Bath and West of England Society," where a correspondent states, that, being in great want of provender, and having scarcely any hay, he was compelled to feed his beasts on fir tops. And though he had more than four hundred head of neat cattle, yet he did not lose above four or five out of that number; while many graziers, farmers, and breeders, who resided in the same county, lost one-half, and several of them nearly the whole of their live stock. We state this fact, as it was communicated to the respectable society above mentioned; and would recommend attentive experiments to be farther made with this vegetable production, as, in the event of a scarcity of winter provender, it promises to be a salubrious and invigorating food, which might in a short time be collected.

Lastly, among the various vegetable productions that have been appropriated to the stall-feeding of cattle, potatoes will furnish an excellent supply, particularly when cut and steamed by means of the contrivance already referred to; and, from the subsequent facts, they appear adequate to the fattening of neat cattle, in combination with a comparatively small portion of other food. In the eleventh volume of "Annals of Agriculture," we meet with the following statements relative to these roots, by J. H. Campbell, Esq. of Charlton, in Kent, an able and successful
OF FEEDING NEAT CATTLE.

grazier, in answer to some queries that had been proposed to him by Mr. Young. He observes, that 100 bushels of potatoes, and 700 weight of hay are generally sufficient to fatten any ox that thrives tolerably well. The roots should at first be given in small quantities, which should then be gradually increased to one or two bushels per day; dry food being always intermixed, and the proportion of hay being uniformly regulated by the effect which the potatoes produce on the bowels. There ought to be at least five servings in the day; and according to the quantity of roots which a beast can be induced to eat with appetite, he will fatten the sooner, of course with less expense and more profit. The hay should be cut once, or if it be not very weighty, twice along, and three times across the truss, so as to be in square pieces of eight or ten inches, in which state the cattle will eat and digest it more readily, while their fattenning is considerably expedited. The potatoes, however, according to Mr. C. need not be cut, except at first, in order to entice the beasts to eat them; but they ought always to be fresh and clean. No corn or meal is necessary, unless it can be procured at a moderate price; in which case it would contribute materially to facilitate, and of course to render more profitable the whole system of cattle-feeding. Should a scouring be brought on by the use of raw potatoes, which often happens, the quantity of hay, meal, or other dry food given with them, should be increased till the beasts become accustomed to the roots, when this inconvenience will cease.

Having thus stated the various vegetable productions which have been beneficially employed in feeding and fattenning neat cattle, we proceed to detail a few hints respecting other articles which are, or may be, likewise employed with advantage. For this purpose, linseed oil-cake has long been celebrated as eminently useful; but as the fat of beasts, fattened on this substance, is not calculated for persons of
gross habits of body, and, after being cooked, is of a loose, flabby texture; and as the price of the cake has of late years greatly increased, it has been recommended to substitute linseed jelly, which is, infinitely superior; and which, when mixed with a due proportion of hay or meal, affords an excellent composition for stall-feeding and fattening. It is prepared in the following manner: to seven parts of water let one part of linseed be put, for forty-eight hours; then boil it slowly for two hours, gently stirring the whole lest it should burn. Afterwards, it ought to be cooled in tubs, and mixed with meal, bran, or cut chaff. Mr. Moody, an eminent grazier, already mentioned, gave two quarts of this jelly, per diem, to every large bullock, which proportion amounts to little more than one quart of seed in four days, and produces a great saving in the article of food.

In America, experiments have been tried with linseed oil mixed with the meal of Indian corn. The stall-fed steer, to which the composition was given, was observed to thrive rapidly, and to sweat most profusely; but, through inattention, too large a proportion of oil was given at one time with the food, which disgusted the beast, and occasioned the experiment to be discontinued. There can, however, be no doubt, but that linseed or flaxseed jelly is more agreeable to cattle than cake, while it renders them less liable to surfeit, in case an extra quantity should be accidentally given, and is less liable to affect the meat with a peculiar taste than either oil or cake, and consequently it merits a trial. To each bullock, or fatting animal, therefore, about half a gallon of jelly may be given every day, mixed with meal and cut straw; but it will be requisite to change this food about a month before the beast is killed, to prevent, if possible, the flesh from retaining the flavour of the oil, cake, or jelly.

Cattle, fed on a mess of sour food, prepared by fermenting rye-flour and water into a kind of paste, and then diluted with water, and thickened with hay cut small, are
also said to fatten quickly. This practice chiefly prevails in France, whence it was introduced into this country. Concerning the efficacy of acid food, in fattening animals, there is much difference of opinion. It is well known, that hogs derive more benefit from sour milk and swill than when those articles are in a fresh state; and it is highly probable, that sour articles may contribute to promote digestion, and, by facilitating the consumption of a large quantity of food in a stated period, consequently expedite the fattening of cattle. But such acid messes can only, we conceive, be considered as preparatory to the more forcing and essential articles of dry food; without which it is scarcely possible that any steer, or bullock, can acquire that firmness of muscle and fat which are so deservedly admired, and considered as the criterion of excellence.

The wash, or refuse of malt, remaining after distillation, which was formerly applied exclusively to the feeding of swine, has of late years been applied with success to the stall-feeding of cattle. It is conveyed from the distillery in large carts, closely covered, and well jointed, in order to prevent leaking. The liquor is then discharged into vats, or other vessels, and when these are about two-thirds filled, a quantity of sweet hay, previously cut small, is immersed for two or three days, that the wash may imbibe the taste or flavour of the hay before it is used. In this state it is carried to the stalls, and poured into troughs, whence it is in general eagerly eaten by cattle. Sometimes, however, the beasts are at first averse to this mixture, in which case it has been recommended frequently to sprinkle their hay with the wash; thus, having the smell continually before them, and seeing other animals eating the same composition with avidity, they gradually become accustomed to it, and at length greatly relish it. The cattle fed in this manner are asserted, not only to repay the expence of their keeping by fattening speedily, but also yield a large quantity of valuable manure.
With equal success has molasses, or treacle, been employed; though the expense incurred by the use of this article will probably prevent its general adoption. It was first used in the West Indies by Mr. Millington, who found it, in combination with farinaceous substances, and, when these could not be procured, with cane-tops, oil-cake, and other articles of dry food, together with a little hay or not too green fodder, greatly to expedite the fattening of cattle in general, and of old and decayed oxen in particular. He gave from half a pint to a pint of molasses twice in the day to every starving animal, which had been exhausted by continual and severe labour for a long series of years. In adopting this article, a gallon of oats, or other damaged grain, roughly ground, or the same quantity of potatoes, should be boiled in a sufficient proportion of water to form a thick mash. It must be well stirred while on the fire, to prevent it from burning, or sticking to the sides of the vessel; and, when it becomes cool, the mixture is to be formed into balls of about one pound weight each. These balls are divided into two equal portions, which, being previously immersed in the treacle, are given to the beasts in the morning and evening; they will devour them with eagerness, and will speedily thrive and fatten by the addition of a little hay, or any green fodder, that is not too succulent. Farther: one or two spoonsful of salt may be dissolved in the composition, which will contribute to preserve the health of the animals; and, in case corn cannot be conveniently procured and ground, pulverized oil-cake, diluted with water and seasoned with a small quantity of salt, with the same proportion of molasses, may be advantageously substituted.

In the preceding facts and statements we have referred chiefly to the feeding and fattening of middle-aged and old cattle; young stock, however, require particular attention, lest their growth be impeded, which no summer food can
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restore, and therefore should be fed on the best and most nutritious food the farm can supply. Hence, Mr. Young recommends yearlings to be fed during the winter with hay, turnips, carrots, potatoes, or other roots; where hay cannot be obtained, good straw must be substituted, the proportion of roots being increased and given with attention. For steers and heifers two years old, the proper food is hay, if it be cheap, or straw, with baits of turnips, cabbages, carrots, &c. In summer, their food varies so little from that above specified, as to require no particular details on this head.

With regard to oxen used in draught, it should be observed, that they ought to be well fed, and every attention bestowed, that no food be wasted, while they are to be kept in constant employ, particularly in the commencement of spring and in autumn, when their labour is most wanted. During those seasons, they may be supplied with abundance of cut hay and straw, with an allowance of from twenty-five to forty or fifty pounds weight of steamed turnips, cabbages, or carrots per day; giving them, while at plough in autumn, such a proportion of oats and chaff as the size of the animal may require, because the grass at that time begins to diminish in its nutritive properties. In summer, the beasts may be soiled with green food, and in the winter stall fed, in the manner and with the articles above mentioned.

But the most important object in the feeding or fattening of cattle is, regularity in giving them food. In stall-feeding, it is too common a practice to give a certain mess, or allowance, every day, without regard to any circumstance; the absurdity of which conduct is too obvious to be here particularly pointed out. It is a fact, that a bullock or fattening beast will eat with a keener appetite on a cold day than in warm, damp weather; hence his mess ought to be proportioned accordingly. By giving the same quantity
every day, the animal may be induced to overeat himself; thus his appetite becomes impaired, the food is wasted, and several days will necessarily elapse before he can recover his natural appetite. By such delay he must fall away, and many weeks, perhaps months, will be required to bring him to his former good flesh.

The relative proportion of roots consumed by fattening beasts necessarily varies, according to the size of the animals, and the nutriment afforded by the respective vegetables. It has, however, been found, that twelve stone of cabbages are, upon an average, sufficient for cattle weighing about eighty stone. Fattening beasts require about one-third of their weight of turnips, besides an adequate allowance of dry meat to counteract the superabundant moisture of those roots. For middle-sized animals a bushel, or a bushel and a half, of distillers' or brewers' grains will be sufficient, if combined with an ample portion of cut hay, chaff, or bean straw, given between the intervals of allotting the grains. Bullocks, or oxen, varying from forty-five to sixty stone, consume about eight or ten stone of carrots or parsnips per diem, besides an additional quantity of dry provender; that is, in the proportion of one-sixth part of their own weight. Of potatoes, small cattle (such as those of Wales and Scotland) eat every day about one bushel per head, in a raw state, with an allowance of one truss of hay divided between four beasts. To an animal of eighty or one hundred stone, about ten or twelve pounds of pulverized oil-cake are given each day, with half a stone, or one stone of cut hay, in addition, every day, for seven or eight weeks, which allotment of cake is then usually increased to eighteen pounds per diem, until the animal is sufficiently fat for sale.

But whatever articles of feed may be given, they ought to be apportioned with as much regard to regularity of time and quantity as is practicable; hence three-periods of the
day, as nearly equi-distant as possible, should be selected, when such an allowance should be given to each animal as he can eat, with a good appetite; which point can be regulated best by attending duly to the state of the weather, or season; thus the beast will improve progressively and uniformly, while a trifling loss of food only can occur by such method. It may however be remarked, in general, that the larger a bullock is the more he requires to support him, though some beasts will consume nearly the same proportions of food throughout the period of their fattening. And in order that this important branch of rural economy may be properly conducted, the young grazier will find it serviceable to weigh each beast once a fortnight, at the least, before he gives the morning allowance, by which he will be enabled to form an accurate estimate of the real progress his cattle make in thriving. If they do not continue to advance, according to the result of former weighings, it will be necessary to change their food; and as bullocks will take less meat every week after their kidneys are covered with fat, it will be well to weigh them once a week, as a more adequate idea of their thriving may thus be formed.

Of equal, if not superior, importance with regularity in feeding is cleanliness, a regard to which is admitted, by all intelligent breeders, to be one of the most essential requisites to the prosperity of cattle. Hence not only ought they to be supplied with abundance of pure water, as already intimated; but also, whenever they are brought into the stalls, either from pasture or from work, their feet ought to be washed, lest any filth should remain there and soften their hoofs. Farther: frequent washing after hard labour, or at least once in the week, should be performed; and, though the practice of currying and combing, or of friction with brushes, cannot perhaps be adopted, or carried into effect, where the herds of beasts are numerous; yet, we

* Aute, Chap. II. Sect. II. § 8. p. 89.
conceive, they might be often rubbed with a wisp of straw to considerable advantage. The mangers and stalls should likewise be kept as clean as possible; and the former, if they cannot often be washed, should be cleared every morning from dust and filth, which may be easily effected by means of a common, blunt-pointed bricklayer's trowel. After the stalls have been cleansed by constantly removing the dung and sweeping the pavement clean, a sufficient quantity of fresh litter ought to be strewed over, which will invite them to lie down; for nothing contributes more to expedite the fattening of cattle than moderate warmth, ease, and repose. In fact, where straw can be obtained at a moderate price, supposing the farm does not yield an adequate supply for this purpose, the stalls and farm-yards ought always to be well littered, especially during the winter season. The quantity of manure thus made is an essential object; and the following interesting hints on this subject, selected from Mr. Young's valuable Calendar, will show certain proportions of dung to straw. Mr. Moody, whose improvements we have already had occasion to notice, littered forty-five oxen, while fattening, with twenty waggon loads of stubble, by which he raised two hundred loads, each three tons, of rotten dung, worth 7s. 6d. per load.

Every load of hay and litter, given to beasts fatting on oil-cake, yields seven loads of dung, of one ton and a half each, exclusive of the weight of the cake. And, on comparing the dung obtained by feeding with oil-cake with that of the common farm-yard, it has been found, that the effects produced by spreading twelve loads of the former on an acre, considerably exceeded those of twenty-four loads of the latter manure. By another trial made by Mr. W. White, it appears, that thirty-six cows and four horses, when tied up, ate fifty tons of hay, and had twenty acres of straw for litter; they made two hundred loads of dung, in
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rotten order for the land. Hence, it appears, that straw may be safely purchased, even at a high price, with a view to the great benefit that may be derived from the dung. But, with all the advantages thus to be derived from litter, the cattle will not thrive, unless every species of carrion and filth be removed, lest they should generate any dis-
temper, especially the dung of poultry and swine, to which neat cattle have great aversion.

Having now stated the leading facts and experiments that have been made on the subject of feeding and fattening of neat cattle, we shall conclude the present section with a few remarks on the sale of beasts, when properly fattened for that purpose. In order to ascertain this point, the fol-
lowing hints may, perhaps, afford some criterion. First, when the general shape and composure of an animal appear best proportioned, each member being comely, and each bone covered with flesh in the manner required to consti-
tute a perfect shape, it may be concluded that the beast is well fed; especially when his hip-bones, or, as they are sometimes termed, his huckle-bones, are round, his ribs smooth and not sharp, his flanks full, and cod round. When these marks are perceptible, the beast may be handled, and his lowermost ribs felt; if the skin be kindly or mellow, that is, soft yet firm to the touch, it is certain that he is well fed outwardly, or in other words, upon the bones. Next, the hand may be laid upon his hip or huckle-
bones, and if they likewise feel soft, round, and plump, it may be safely concluded that the animal is well fed, both externally and internally; that is, both in flesh and in tallow. Farther: he may be handled at the setting on of his tail, which, if it be thick, full, and soft to the touch, is also an indication that the beast is well fed externally; the same circumstance is likewise evinced by the nach-bones, which lie on either side of the setting on of his tail, feeling mellow, or soft and loose. Lastly, the cod may be ex-
amined, if an ox, or the navel if a cow, and if they respectively feel thick, round, large, and plump, it is a certain criterion that the beast is will tallowed within; though, when any of these parts or members handle contrary to the rules above mentioned, a contrary judgment must be formed.

After all the attention and labour which the grazier may bestow, his hopes are liable to be frustrated, in some measure at least, unless he select a proper time for disposing of his fat cattle. The most common season for beef is at Michaelmas, when the markets are more abundantly and more cheaply supplied than at any other period of the year; as the numerous cattle which have been fattened on luxuriant pasture grounds, are then brought for sale. Hence the attentive grazier will find it most beneficial, at this time, to dispose only of part of his stock. Beasts are chiefly driven to London for sale; and, where the distance from the metropolis is very considerable, they are liable to very many calamities or accidents on the road, to omit their diminution in point of weight; which, even under the eye of the most attentive drivers, is necessarily incurred, and is often great; while, from the fluctuation of the market, like that of the funds at the Stock Exchange, his risk is very considerable. It will, therefore, be advisable, where it can be conveniently or advantageously effected, to dispose of fat stock in such markets as are in the vicinity of, or at an easy distance from, the farm.

In drawing off one or more lots of cattle for sale, it is the general practice to dispose of the fattest animals, and to keep those which do not fatten kindly for additional exertions. Such procedure may indeed, as Mr. Young has observed, be admitted to a certain extent, if the food provided be not expensive; but, if the beasts are reserved for corn or cake feeding, or if the supply of other food is precarious or limited, this conduct is highly questionable. Costly
FOOD should not be given to cattle that have evinced themselves to be unthrifty; on the contrary, the most thriving animals in the lot ought to be chosen for this purpose, for the pursuing of an opposite conduct has often been the reason why all winter fattening has been so heavily censured and condemned. As soon as a grazier is fully convinced, that he has a beast which is not kindly disposed to take on fat, or is an ill-doer, the first loss is obviously the best, and he should dispose of the unthrifty animal the earliest opportunity.

The common mode of selling cattle for slaughter is by lots; and, in this case, to prevent confusion between the parties, or loss on the part of the feeder, care should be taken to fix the precise time in which any particular lot is to be drawn, in order that no unnecessary food may be consumed. Formerly, and even now, in some places, it is usual to sell by the eye, a method which is certainly unequal as it respects both the farmer and the butcher; for the former, unless he has been accustomed to weigh his beasts during the progressive stages of their fattening, can form at best but an uncertain idea of their weight; while the latter, from his continual practice, is enabled to form a tolerably accurate estimate. Hence some have killed a beast out of a particular lot, with a view to ascertain the average weight of animals in such lot; and, in order to induce a perfect equality between the buyer and seller, it was proposed by the late Lord Kaimes to dispose of every beast by weight, and that such weight should be ascertained by the steelyard, as being best calculated for weighing heavy goods; which mode he used with ease and success for many years.

It is not, however, sufficient to ascertain the weight of a living beast. Different parts of the same animal are different in their value; and, as he observes, there is a rule for ascertaining the proportion of these various parts, by which their weight may be known with almost equal cer-
tainty as the weight of the whole beast. But, before we proceed to specify such rule, it is necessary to premise, that the following proportions are calculated chiefly for Scotch cattle, to which only Lord Kaimes’ experience reached; but, as great numbers of these are fattened in England, especially in the county of Norfolk, we trust the annexed hints will be found useful*.

The four quarters† constitute half the weight of the bullock; the skin is the eighteenth part; the tallow the twelfth part; making twenty-three thirty-sixths, or about two-thirds of the whole; the remaining third part, or a little more, is composed of the head, feet, tripe, blood, &c. which offals never sell by weight, but at a certain proportion of the weight of the beast. They commonly produce 10s. 6d. when the bullock weighs one hundred Dutch stone, and so on in proportion. These particulars being adjusted, the next point which the seller is to ascertain is the market price of butcher’s meat, tallow, and hides. Supposing the bullock‡ to be sold is seventy-two stone living weight, the four quarters make thirty-six stone, which, at 4s. per stone, or 3d. per pound, amount to 7l. 4s. The hide is worth 16s. at 4s. per stone; and the tallow, being 5s. 4d. the stone, is worth 1l. 12s. sterling. The offals, according to the proportion above stated, will give 7s. 6d.; and, by that computation, the value of the bullock is 9l. 19s. 6d. which

* For ascertaining differences between venders and purchasers of cattle, we know of few more useful manuals than Renton’s “Grazier’s Ready Reckoner,” (12mo. 2s. 6d.) consisting of tables calculated to determine, by admeasurement of a beast’s body, the weight of any animal within certain limits, sinking the offal; and accompanied with rules for taking such measurement.

† Kaimes’ “Gentleman Farmer,” p. 209.

‡ As the weight of beasts varies accordingly as their bellies are more or less full, it is necessary to state, that the proportions above stated were made out when the cattle were weighed at eleven o’clock in the forenoon.
answers to 25. 9½d. per stone living weight. And therefore, if a butcher agree to give that sum per stone, no more is necessary to ascertain the price of the whole carcase than to weigh the beasts, three or four together, as the scale can hold them. But out of this sum must be deducted the butcher's profit, which cannot be much less than 5l. per cent., though we believe it is at present somewhat more.

The weighing of cattle alive, as Lord K. remarks, answers another purpose, viz. to discover whether the feeder gets the value of the food by the additional weight of the beast. For instance, supposing the food of a bullock costs 9d. per diem, or 52. 3d. per week; if the animal does not take on two stone per week, the keeper is a loser, and, as already intimated, it will be highly imprudent to keep such a beast on hand, unless in expectation of a rising market.

Thus having attempted to compress into one view the various important facts that are connected with this department of our work, we shall conclude with the two following tables, selected from Lord Somerville's valuable tract, recently published, entitled "Facts and Observations relative to Sheep, Wool, Ploughs, and Oxen," in which are exhibited the various weights adopted in different counties and districts for equalizing the different modes of calculation.

_Table for the Equalization of different Weights._

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SECTION III.

On feeding and fattening Sheep.

In a former part of this work, the best modes of supporting ewes, during the period of gestation, and while they suckle their lambs, have been stated*; it now remains to specify the most useful methods of feeding and fattening them after they are formed into flocks. Before, however, we proceed to discuss this branch of rural economy, it will be necessary to state the names or terms by which these animals are known at different ages, and in various counties. From the time of weaning to the first shearing, the males are denominated hogs, hoggets, or hoggerels, after which they receive the appellation of shearing, shearling, shear-hog or diamond tups, or rams; after that they are called two, three, or four shear according to the number of times they have been shorn. When male sheep have been castrated they are termed, from the period of weaning to that of shearing, wether or wedder hogs, then shearings, shearlings, &c.; after they have been shorn a second time, they are denominated young wethers, or two-shear wethers, then three, four, or five shear wethers, according to the number of clippings or shearings they have undergone. The females have the appellations respectively following:—from the time of weaning to the first shearing they are termed ewe or gimmer hogs; they then take the name of gimmers or sheaves, which continues only for one year, after which they are invariably denominated two, three, or four shear ewes†; and, when old, they are termed crones.

The successful feeding of sheep must greatly depend on

* Ante, pp. 54, 56.
† Culley on Live Stock, p. 18. For ascertaining the age of sheep, vide p. 7.
the quality of the pasture intended for their reception, and upon the resources which the farmer has for supplying them with food during the trying winter months. Hence, as already intimated, it will be necessary to suit them to the pasture, and on no account to purchase or procure sheep from grounds of a superior quality to those which are destined for their support. With sheep, as with other cattle stock, it has been found that the larger breeds are calculated only for the richest and most luxuriant grounds, while the smaller sorts are best adapted for the less fertile tracts, where the grass is shorter; and as the breeds that are most beneficial for particular situations are detailed in the synoptical table prefixed to this work, we shall here only remark, that the Dishley, or New Leicester, and the South Downs are particularly calculated for the lands of the last-mentioned description.

In the grazing of sheep, as well as neat cattle, various methods are practised, and with different success. Thus, some farmers buy two or three shear wethers early in May, which, for several weeks, are indifferently kept till all the hay has been carted off the meadows, when they are turned into the rouen, or after-grass, and are afterwards forced or fattened off during the winter months, so as to be fit for sale at the commencement of March. This practice is very beneficial, if conducted with care, as mutton fetches the most advantageous prices in that month. Another lucrative method consists in purchasing pregnant ewes towards the close of summer, or early in the autumnal quarter; and keeping them on inferior grass lands, stubbles, or fallow till the beginning of the following year, when they are kept in good condition through the lambing season, and after that in the best manner possible, so that the lambs may be ready for sale in sufficient time for the dams to be fattened for the butcher early in autumn*.

* For the supporting of ewes and lambs during the period above referred to, vide p. 54, 55, 56.
ON FEEDING SHEEP.

Another profitable practice is, the buying of lambs, whether castrated or not, about the end of August, or in the beginning of the following month. The animals thus acquired are, by some graziers, kept in an indifferent way throughout the winter, till early in April, when they are fattened so as to be ready for sale in August, or are continued to the middle or end of September, at which time the whole stock are cleared off the land. Others, however, adopt a system altogether the reverse of this: having purchased the sheep as already stated, they force them with the best keep that can be procured, and dispose of them as quickly as possible.

In grazing sheep, the same remarks are applicable as have been specified in the preceding section. Hence we shall only observe, that the fine grasses* produced on downs are, undoubtedly, the best and most congenial food for these animals: good hay alone will fatten wethers, which may be yet more advantageously prepared for the butcher by means of grass and hay together. Great attention, however, is necessary, that sheep be kept from all grass that is made gritty in consequence of inundations, otherwise they will become affected with the rot. And here it may not be amiss to remark, that the late Mr. Bakewell attributed this fatal disease solely to flooded lands, and the premature but unsubstantial herbage afforded by them. Whenever, therefore, particular lots or parcels of his sheep were past service, his practice was to fatten them for the butcher; and, probably from motives of jealousy, in order that he might be certain the animals would be killed, and not go into other hands, he used to rot them before they were disposed of. This he effected by overflowing a pasture or meadow in the summer, in consequence of which the soil thus flooded inevitably rotted the sheep that were fed on it the ensuing autumn.

* On the subject of grasses; vide Chap. VII. Sect. I. H. III.
Beside humid situations, and the acid grass vegetating there, it will be proper to see that no horses be pastured along with sheep; for experience has proved, that the tufts of long, rank grass that usually spring up after horse-dung, will communicate the rot, unless the grass has been previously exposed to a few nights frost, after which they may be turned in without danger. It is also dangerous to suffer sheep to browse upon the grain, especially that of barley, which shoots up among the stubble after the harvest is completed; and fallows, that are wet and unsound, are equally detrimental, whether the soil be light or strong. In the former situations, they frequently pull up the herbs by the roots, which they eat with the dirt adhering to them, which will inevitably give them the rot; and if the fellows be strong land, and should not afford a sufficient supply of food, they are liable to the hunger-rot, from being compelled to eat the rank, unwholesome vegetables produced on such grounds; especially the lesser spearwort (Ranunculus flammula, L.) and the marsh pennywort (Hydrocotyle vulgaris, L.); both of which plants flourish on wet situations, and ought carefully to be eradicated wherever they are found. In such pastures, however, as are subject to give sheep the rot at certain times, it will be advisable to let the lambs run with the ewes, the longer the better; for though these tender animals are more susceptible of injury in those unsound places than full-grown sheep, yet they are seldom attacked with the rot, suckling having been found a preservative against it.

Farther, in turning sheep into pastures, particularly water meadows, and also into those places that are subject to rot, it will be necessary to pursue the same precaution as with neat cattle, viz. previously to satisfy the craving of appetite, by giving them hay or cut straw; and, after the dew has been evaporated by the rays of the sun, to drive them gently round the field for two or three hours, before
they are suffered to feed. But, whenever any sort of dry food is given, they ought to be supplied with pure water, particularly during the intense heat that usually prevails during the dog-days, and which often renders the grass as dry as stubble. It has likewise been recommended to fold these animals before the dew falls, and to keep them in fold until it exhales, both in the spring and in summer, feeding them with hay or similar dry food.

The best time for turning sheep into summer pastures is in May, when every attention should be paid to proportion the sheep according to the luxuriance of the grass; and, as these animals are with difficulty restored to good condition when injured by want of sufficient food, it will be advisable rather to understock than burthen the land with too large a number. The average allotment of these animals to an acre of clover may be from four to six or seven; though there are some situations which will carry still more.

In the distribution of sheep there is another circumstance worthy of notice—the profit which may be derived from pursuing a system of close-feeding; thus the plants will not only be prevented from running up to seed, and consequently, being preserved longer in the leaf, will afford a greater supply of food, but also those grasses, which are naturally coarse and unprofitable, will be kept down, and become sweet and valuable.

With regard to the practice of folding of sheep, there is a difference of opinion among graziers and breeders. The period chosen for this purpose is the month of May; and, as Mr. Young has justly remarked, this practice is (when relied on) of such importance, that it should be steadily pursued. Many farmers give a very slight dressing, one night in a place, and the fold three square yards per sheep; whereas they ought to be folded two nights in the same spot, and one, or at most two, square yards allotted to each
animal. If arrable, the ground should be perfectly black, and if grass, well covered with dung. For this purpose turnip and cabbage fallows are best calculated, as those vegetables, being sown and planted in June, will consequently derive immediate benefit.

These hints, however, are given on the supposition that the openness or other circumstances of the farm, render the practice of folding necessary; for, though it still prevails in some districts, yet it is attended with many inconveniences, which have induced several eminent farmers to discontinue it. Not only, indeed, are those lands, which are in any degree moist, liable to be poached by the treading of the animals; but also these, by being driven three or four times in the day to the fold, are liable to be excessively fatigued; so that the stronger sheep only can feed without receiving much detriment. Besides, young lambs are often seriously injured; the ewes are liable to be hurried and heated; and as the sheep are, in fact, moving throughout the day, the weaker animals are thus prevented from feeding at pleasure, while no inconsiderable portion of food is trodden under foot, and irreparably wasted.

The late eminent Mr. Bakewell was decidedly averse to the practice of folding; considering the advantages supposed to be derived from it as visionary, as, in fact, robbing a large portion of a farm, in order to enrich a small part. He was of opinion that the keeping of large flocks together, even of any number exceeding a hundred, is a barbarous practice, as the strongest will always consume the best food, which ought to be appropriated to those which are less hardy; and observed, that if folding be necessary on farms that have no commons appendant to them, why should there not be different small folds, on different parts of the farm, for animals of various ages, kinds, and strength, and thereby save the trouble of driving them from one part of a farm to another? For, is it not preferable,
after the animal has filled its belly, that it should lie down to sleep (and let it not be forgotten that repose contributes materially to promote fattening) than travel, in order to create an appetite?—From extensive and accurate observation, in various parts of this island, Mr. Bakewell became confirmed in his opinion of the inefficiency of folding; and his example has been followed by Messrs. Young and Coke, (two of our most enlightened agriculturists), both of whom have relinquished the practice.

The idea above suggested, by Mr. Bakewell, of keeping sheep in small flocks, is very important, and productive of much advantage; it has been adopted, in its full extent, by Mr. Boys, of Betshanger, in Kent, who has divided his numerous sheep into four flocks, each of which is committed to the care of a distinct shepherd; and who is so convinced of the profit of his conduct, that he would not for a moment admit that any question could be made of it.

Having already pointed out the most useful criteria for separating sheep into small flocks, (p. 61, 62) we shall only observe, that though straggling folds are evidently an expensive as well as injurious practice, every advantage which can be expected from them may be derived by having standing folds, either erected on dry spots, and in the most convenient parts of the farm (where this is very extensive); or (which is preferable) a part of the farm-yard may be fenced in, and provided with sheds open towards the sun; and, having pens for receiving the flocks accordingly as they are separated, so that the sheep may be let out to exercise themselves on the land for a few hours in the middle of the day, unless the weather be extremely unfavourable. In this system of cotting, the floors of the various sheds ought to be covered with chalk, well beaten in, and laid on a slight declivity, for the discharge of the urine, which, as well as the dung, should be frequently removed, for cleanliness is essential to the thriving of these
animals. The practice here stated will, indeed, render an abundant supply of litter necessary; but the additional expense thus incurred is more than compensated by the ample supply of manure thereby obtained, as the following fact will fully prove. Mr. Arbuthnot penned 134 sheep and 30 lambs, for six weeks, in a standing fold, and littered them with five loads and forty trusses of straw, which produced twenty-eight large loads of dung. They were fed morning and evening in the fold with turnips, and, during that time, consumed two acres of those roots. The annexed account will evince the benefit of this practice more clearly than any remarks we can add on the subject:

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<td>Straw, at 20s.</td>
<td>5 15 0</td>
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<td>Profit</td>
<td>£4 5 0</td>
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<td>Per acre for turnips</td>
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<td>And per score per week</td>
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Having, in a former chapter*, stated the most eligible mode of supporting ewes and lambs through the trying seasons of winter and spring, previously to their being turned into summer pastures, we shall subjoin a few supplementary remarks on the most useful articles of winter food.

Of late years, it has become a frequent practice to soil sheep in summer with the various artificial grasses, with cichory, tares, green peas, and beans during summer; and to supply them with corn, as well as green food, during the winter. In this view barley meal, when abundant and cheap, may be advantageously combined with green meat, and will speedily fatten wethers: pulverized oil-cake has also been given; but, as it is apt to impart a peculiar flavour to mutton,
ON FEEDING SHEEP.

it may be beneficially replaced by corn, ground or in a green state, by hay, straw, and fog or after-grass reserved for this purpose. Borecole and burnet also supply excellent food for sheep during the winter, particularly towards the close of that season. But few vegetables are at present in greater request than turnips, as an article of winter keep; they require, however, to be sliced, to prevent accidents; as also do potatoes, which, when steamed or baked, contribute rapidly to fatten sheep.

There are, however, various methods in use of giving turnips to sheep: by some farmers, they are promiscuously turned into a field, and allowed to eat the roots at pleasure; but this practice is by no means economical, as many turnips must necessarily be trodden under foot and spoiled with dung. Others divide their land by hurdles, and inclose the sheep in such a space as these can clear in one day, advancing progressively through the field till it is cleared. Another method is, to pull up such a quantity of turnips as they can consume in one day, when they are successively admitted into the various inclosures: this is more advantageous than either of the former modes, as a piece of land, contiguous to the turnip field, may thus be manured without the expence of carting manure thither. But we conceive the most economical management will be to give the cut or steamed roots at home, by means of the troughs and other contrivances mentioned in a subsequent page; and, when combined with a few bushels of peas, or a proportionate allowance of good hay, they will afford additional nourishment, and render the animals uncommonly fat. Farther, sheep will eat parsley with great avidity, which imparts to their flesh a peculiarly delicate flavour; that vegetable, however, is rather to be considered as medicinal, than as an article of food, it being found very serviceable to such animals as are scabby, dropsical, or disposed to rot.
But the fattening of sheep cannot be conducted to advantage without regularity in distributing, and economy in the management of, the various articles that compose their food. Hence it will be necessary to have troughs, with partitions in the middle and with racks annexed, about two feet high from the ground, the whole being firm and steady, so that it cannot be overturned. This contrivance is well calculated for use, whether at home or abroad, for the prevention of waste; with the same intention, the machine delineated in the annexed figure has been successfully employed in the county of Lincoln.

This contrivance is denominated a tumbril: it consists of a circular cage or crib, which may be made of osiers, willows, or other pliant brushwood. The whole is about ten feet in circumference, and closely wattled to the height of about one foot, above which it is left open for the space of eighteen inches; it is then wattled again to the height of eight or ten inches, and an opening, about eighteen inches in breadth, is left at the top for putting in the roots.
ON FEEDING SHEEP.

or other food, whether green or dry. The staves which form the skeleton of this utensil are ten inches asunder, so that twelve sheep may feed at the same time in each tumbril.

Considerable benefit may be derived from the adoption of the simple contrivance above represented for the purpose of feeding sheep; for it not only effects a material reduction in the consumption and expense of provender, which is thus prevented from being trodden under foot, or soiled with dung; but also, in this state of separation, the stronger sheep cannot drive away the weaker, as each is secured by the head. Besides, as the construction of such a tumbril is attended with no difficulty, it may be easily procured, and conveyed to any part of the farm; and, with due care, may be kept in constant use for eight or ten years.

But whatever system of management may be adopted by the farmer, whether at home or in the field, he ought on no account to withhold salt from his live stock, especially from sheep; for, not only does the continual use of that article contribute to the digestion of succulent vegetables, and of course preserve the animals in constant health, but it is also said to improve both the quantity and the quality of the wool. Hence, as it augments the nourishment of the food eaten in proportion to the quantity of saline matter, it ought to be particularly used in those moist situations, the produce of which is liable to rot sheep, of which malady it is both a preventive and a cure. Rock-salt is undoubtedly preferable; but, where this cannot be conveniently procured, it will be advisable to dissolve common salt in water, and, mixed with fine, pure clay, into masses or lumps, which may be placed under shelter, so that the sheep may lick it at pleasure.

Throughout the whole system of sheep husbandry, the

* "Repertory of Arts and Manufactures," vol. iv. first Series.
greatest attention is necessary, on the part of the shepherd, regularly and frequently to inspect the animals committed to his charge; and, in order to facilitate this object, it has been recommended to have a moveable sheep-house in which to reside; thus, being always on the spot, he will be enabled to assist the sick or weaker animals, and will prevent many of those accidents which must otherwise unavoidably happen.

SECTION IV.

On the feeding and fattening of Swine.

When permitted to wander abroad, at pleasure, swine devour in marshy and miry grounds (in which situations they delight to wallow) fern, frogs, sedge, &c.; but, in drier spots, they feed on sloes, crabs, hips, haws, chestnuts, acorns, beechmast, and similar wild fruit. In the domestic management of these animals, however, the quality and supply of their food is regulated by the divisions into which they are classed, according to their age and other circumstances. In order, therefore, that the food may be expended to the most advantage, it will be advisable to distinguish these animals in the following manner: 1. Sows with Pig; 2. Pigs; 3. Store-pigs; and 4. Fatting Hogs.

1. With regard to sows in pig, it is obvious that they should be better fed than either of the other classes, in order that they may be enabled to supply their young litter with the necessary supply of milk; but, while care is thus taken to keep them in good condition, equal caution is necessary that they be not too fat. Thus, for such as litter in the spring, tares and cabbages, combined with the waste milk and wash of the dairy, may be employed with advantage; or, if the supply from the dairy be not adequate to the demand, a wash may be prepared with oat, barley, or other meal. For those which litter in autumn,
ON FEEDING SWINE.

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Lettuces have been found very wholesome and nutritive, in addition to the wash; and, in the winter season, potatoes, turnips, and other roots, previously prepared by boiling, should be added.

2. With regard to young pigs*, where it is practicable, they may be fed in the same manner as sows, with the addition of oats and peas soup, made by boiling a bushel and a half of peas in about sixty gallons of water till they are thoroughly broken and dissolved; this soup may then be mixed with the dairy wash; or, if given alone, it will, in the opinion of Mr. Young, wean them well. If any dry meat be given, he thinks oats are preferable to any other sort of corn, as barley is apt to disagree with them†.

3. Store-pigs are those which have attained nearly half their growth, and should be separated from the others in the course of May, when they may be turned into the clover and cichory fields, the gates of which should be locked on them. Here they are to continue till Michaelmas; but, in order that this system of management be attended with due effect, it is necessary that all the fences be in excellent repair, and that there be a pond in the field to supply the animals with water. From such practice the most beneficial consequences must result, the farmer being thereby enabled to keep a larger number of swine, while the increased quantity of manure will amply compensate the expense attending it‡.

* The practice of ringing pigs, while young, has been mentioned in a former page: the following method, which was announced at Lord Somerville's cattle show, in March 1805, has been successfully adopted by Mr. Tubb, a spirited breeder. It consists simply in shaving, or pairing, off with a razor, or sharp knife, the gristle on the tops of the noses of young pigs; the place soon heals over, and they are thus rendered incapable of that destructive rooting, or turning up of ground, which farmers find so detrimental to sward land.

† Farmer's Calendar, p. 23. ‡ Ibid. p. 277.
With all the advantages of the preceding system, Mr. Young prefers the soiling of swine in the yards, notwithstanding the expense is greatly increased, and some portion of food will be necessarily wasted. The proper vegetable crops for this purpose are lucern, cichory, clover, tares, and other green meat. But, in order to carry on this system with effect, he directs the hog-yards to have gates of sufficient width to admit carts for bringing in the food, as well as for removing the dung; nor should it be attempted, unless an ample supply of litter can be command-ed, together with sand and peat, to be laid on the ground for the purpose of absorbing the urine. In addition to the articles above specified, we state, on the authority of Dr. Pulteney, ("Transactions of the Linnaean Society," vol. v.) that the water-crowfoot, (*Ranunculus aquatilis*, L.) is not only relished by swine, but these animals likewise thrive so well on that vegetable, as to require no other food till they are put up to fatten. For the winter keep of store swine the various roots are admirably calculated, such as turnips, potatoes, and the Jerusalem artichoke, which require to be boiled; Swedish turnip, carrots, root of scarcity or *mangel-wurzel*, and parsnips, which may be given in a raw state; and to these may be added peas, beans, and cabbages.

4. The business of fattening hogs is generally performed in February or March, and in the month of October: for *pork*, they are usually fattened from six to nine months old; for *bacon*, from nine months to a year and a half; and store swine to the same period, or very rarely beyond two years. For porkers, butter-milk, whey, and pea meal are preferable; for bacon hogs, equal parts of fresh pollard and pea meal have been recommended; and it is a fact, that white peas are much better calculated than beans either for feeding or fattening swine, as these animals not only fatten more kindly when fed with the first-
ON FEEDING SWINE.

mentioned pulse, but their flesh is also said to swell in boiling, and have a good flavour; while that of swine fattened on beans will shrink in the pot, the fat will boil out, and be less delicate in point of taste. Hence many farmers feed their hogs with pea and barley meal, and will frequently purchase peas when their own store is exhausted, rather than suffer the beasts to feed on beans; and some will even reject grey peas, as approaching too near to the nature of the bean, and making the meat tough and dry.

The proportion of peas requisite to fatten a hog necessarily varies according to the size, breed, and kindliness of disposition to fatten; but, forming an average judgment from the weight of the beast both before and after he is put up, Mr. Knight ("Communications to the Board of Agriculture," vol. ii.) is of opinion, that a hog in good condition when put up, will consume about six or seven Winchester bushels of peas; and states, that each bushel will increase his weight after the rate of nine or ten pounds; so that when the animal is fat, he will weigh twenty score.

The most profitable mode, in the estimation of Mr. Young, of converting any kind of corn into food for swine, consists in grinding it into meal, and mixing the latter with water, in cisterns, in the proportion of five bushels of meal to one hundred gallons of water; this must be well stirred several times in the day, for a fortnight, during warm weather, or for three weeks in a colder season; at the expiration of which time it will have fermented and become acid. In this state, and not before, the wash is ready for use, it ought to be stirred every time before feeding, and it will be necessary to keep two or three cisterns fermenting in succession, in order to prevent it being used before it is duly prepared. The difference of profit between feeding in this manner, and giving the grain whole, or only ground, Mr. Y. adds, is so great, that whoever tries it
once, will not be induced to change it for the common methods. He farther states, that pea soup is an excellent food for hogs; and, as far as he is capable of knowing, for he admits that he has not sufficiently compared them, may be equal to the acid mixture above mentioned, especially if it be given during winter in a tepid or lukewarm state; but, in adopting this method, the additional expence of fuel and labour must be taken into consideration.

For the general stock of hogs, during the month of October and part of November, cabbages are of incomparable use. Swine, Mr. Y. observes, are at that period often very cheap; and in such case it is of material consequence, that the farmer be amply supplied with an article of food, by which means he can keep this stock for a better market; in fact, without a provision of cabbages, it will be impossible to keep large stocks of swine to the best advantage.

The duration of time which is requisite for fattening these animals may, upon an average, be computed at five or six weeks, or thence to two or three months; and this period will, in most cases, be found fully adequate for the purpose, though the length of time is necessarily regulated by their kindliness of disposition to take on fat, the relative goodness of their condition, when first put up to fatten, and various other circumstances which it is impossible to foretel with precision.

But, whatever system of fattening swine may be adopt-ed, it is of essential consequence that they be kept warm and clean, especially, in cold and damp weather, during the period of fattening; and that they also be supplied with abundance of litter, the cost of which will be amply repaid by the increased proportion of excellent dung thereby obtained. It has, indeed, been frequently asserted, that swine thrive better while fattening, if they be allowed to wallow, at home, in their own filth, and abroad in mud and wet, be-
cause they delight in this habit; and thence it is assumed as certain, that it tends to their advantage. Such assertion, however, is rather the offspring of prejudice than the result of real experience; we know that animals, when oppressed with heat, will plunge into water in order to cool themselves; but it cannot be inferred from this circumstance, that it will be necessarily beneficial to them. Besides, as there is an analogy between the disorders of this part of the brute creation and those of the human race, as well as in the causes whence they originate, we shall here only remark, that swine are liable to be affected by drinking too much cold water, or wallowing in miry and humid places when overheated, and refer the reader to the subsequent chapter, where the maladies incidental to these animals are discussed. In addition, therefore, to the remarks already given (p. 66, 67) relative to the structure and situation of the piggery, we shall here state, particularly with reference to its connection with their fattening, that a hogstie should be built with the advantage of running water, so as to admit sufficient for the swine to drink, if such a situation can be commanded; the floor, or ground, being laid upon a gentle declivity to carry off their urine.

Not only, however, should these animals be kept warm and dry while fattening, but they should also be confined, if possible, by themselves; or, at all events, there should be as small a number in the same stie, and as much out of the hearing of the cry or grunt of other hogs as possible; otherwise, upon their first confinement, they will pine and decrease in flesh, notwithstanding they have abundance of food given them. By this means they will both have more room, and be also enabled to take more frequent and uninterrupted repose, which greatly contributes to promote their fattening; beside which, all those inconveniences will be effectually obviated, which often occur from hogs becoming averse to some particular animal, whose death not
unfrequently follows in such cases. *Regularity of feeding* should likewise be especially regarded, as it has great influence in facilitating or retarding the fattening of swine; hence it will be proper to give them a full allowance of food three or four times, or at certain other stated intervals, in the day, as convenience or other circumstances will allow. And, if any animal should have surfeited itself (which is no unusual occurrence, where due regard is not bestowed on the point last stated) by eating too large a proportion of food, it will be advisable to give such beast about half an ounce of flour of sulphur in some wash, once or twice in the course of the day, for two or three successive days. By this simple remedy their palled appetite will be restored more effectually than by administering antimony, or any other drug that has been recommended to use in fattening swine; for, however such articles may *possibly* have succeeded in a few instances, it is obvious that they cannot be generally employed with advantage, and may not unfrequently be productive of hurtful effects.

Having already stated (p. 67, 68) a few data that will assist the breeder to form an estimate of the progress made by hogs in fattening, and of course the most proper time to dispose of them with benefit, we shall conclude this section with a few remarks on the best modes of converting their flesh into *bacon* and *pork*.

In Hampshire, Berkshire, and some of the adjoining counties, after a hog is killed, the first process is to *swale* him, or singe off the hairs, by kindling a straw fire round the dead animal. Next, he is cut into flitches, which are effectually rubbed with a mixture of saltpetre and common salt, and are laid in a trough; here they continue from three weeks to a month, in proportion to their size, and are frequently turned during that time. Thence they are taken out and suspended in the chimney, over a wood or turf fire, till
they are perfectly dried. In the county of Kent they are dried before a slack fire, which operation requires a similar period of time with that required for salting; and, in each of the respective counties above mentioned, they are hung up, or deposited on racks, till they are wanted for domestic consumption.

_Somersetshire_ or _Wiltshire_ bacon, which is the most esteemed in England, is prepared and cured in the following manner:—When a hog is killed, the sides are laid in large wooden troughs, and sprinkled over with bay salt, after which they are left for twenty-four hours, in order to drain off the blood and superfluous juices. Next they are taken out and wiped thoroughly dry, and some fresh bay salt, previously heated in an iron frying-pan, is rubbed into the flesh till it has absorbed a sufficient quantity; this rubbing is continued for four successive days, during which the sides, or _fitches_, as they are usually called, are turned every other day. Where large hogs are killed, it becomes necessary to keep the flitches in brine for three weeks, and in that interval to turn them ten times, after which period they are taken out and dried in the common manner; in fact, unless they are thus treated, they cannot be preserved in a sweet state, nor will they be equal, in point of flavour, to bacon that is properly cured.

According to the two methods above detailed, the bacon is made without stripping off the hide or skin; in some counties there prevails a contrary practice, which has lately been recommended on the continent, as being preferable of the two, because it affords an opportunity of advantageously converting the skin into leather, while the meat is said to take salt and be cured equally well as in the former mode. This method, however, is not a very novel one; the hides of swine have long since been made into shoes in China, where all the shoes sold to Europeans are manufactured from hog leather, the hair being previously
burnt off by means of a red-hot iron. Where the consumption of bacon is very rapid, the practice last mentioned may be adopted; but we know from experience, that bacon will, in a short time, become rusty, and consequently waste will more or less be incurred, unless it be cured with the rind or skin, and be preserved in a dry room.

The hams of hogs are likewise converted into a favourite, though not a very digestible, article of food. In the county of Westmoreland the following method prevails*:—First, they are rubbed very hard, usually with bay salt, after which they are by some curers covered closely up, while others leave them on a stone bench for the purpose of draining off the brine. At the expiration of five days, this friction is repeated with equal vigour with bay salt, combined with somewhat more than one ounce of saltpetre to each ham. Next they are suffered to lie for about a week, either in hogsheads among the brine, or on stone benches, when they are hung up in the chimney to dry. In this last part of the process there is a difference of practice: by some they are suspended so that they shall be dried solely by the heat arising from the fire below, without being exposed at all to the smoke; by others they are hung up in the midst of the smoke, whether this arises from coals or peat. If not previously sold, they are suffered to continue there till the weather becomes warm, when they are packed up with straw or oat-meal seeds, and sent to the respective places of sale.

Another mode of curing or preserving the flesh of swine is, by salting it down for pork: the tedious and common process by which such pork is cured being sufficiently known, we shall state the following simple method, which has been employed on the continent with great success, and which is the more valuable as it may be advan-

tageously applied to mutton and beef. First, let two ounces of saltpetre, one pound and a half of refined sugar, and four pounds of common salt be boiled in two gallons of pure spring water, over a gentle fire, and the impurities, that may rise to the surface, be carefully skimmed off. When this brine is cold, it should be poured over the meat, so as to cover every part: for young pork this immersion should continue three or four days; older pork will require one, two, or three days more, according to its age; and such as is intended to be dried for hams, ought to remain in it a fortnight before it be suspended in the chimney. At the expiration of that time, the latter must be rubbed with pollard, and covered with paper bags, to prevent them from being fly-blown. It ought to be observed, that in warm weather the blood must be expressed from the meat, and this should be well rubbed with fine salt previously to pouring the liquor over it; and though the preparation of such brine may, at first sight, appear more expensive than that prepared in the common way, yet we think it deserves a preference, as it may be used a second time with advantage, if it be boiled, and a proportionate addition be made of water, and the other ingredients above mentioned.
The brute creation are, in general, liable to fewer maladies or complaints than mankind; and, as their diseases are less complicated, they are of course more easily to be relieved: yet, among the various phenomena in the history of man, it is not the least singular, that the treatment of sick cattle has hitherto been confined chiefly to the most illiterate and ignorant peasants—men equally unacquainted with comparative anatomy and with the relative powers of medicine. Hence many thousands of valuable beasts have necessarily perished for want of that assistance which attentive observation, aided by sedulous inquiries, might have remedied, if not altogether prevented, by an unremitting regard to cleanliness in every department connected with the rearing of cattle.

With animals, as with the human frame, the variations of the atmosphere have a material influence on health; hence, though the limits of the present work confine our discussions to the chief distempers affecting cattle in general, we trust it will not be altogether useless to premise a few hints, founded on experience, relative to the ascertainment of the different changes of the weather; more particularly as an occasional reference to these remarks may afford the farmer some guide in directing the diversified operations of the field.

Among the various phenomena, which attentive observers have found to indicate approaching changes in the
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atmosphere, the following may be selected as affording the most certain signs.

I. **By animals.**—1. Previous to rain and wind, or stormy weather, *neat cattle* and *sheep* seem more than usually desirous of feeding in their pastures, and to leave them with reluctance. A similar change is announced by the uneasiness of *swine*, which grunt loudly, and retire to their sties; by *geese* and *ducks* washing themselves repeatedly and with little intermission, flying anxiously backwards and forwards; by *swallows*, flying low and skimming along the surface of water, twittering with more loudness than usual; and by *poultry*, rolling much in dust and sand, or gravel. Wet and windy weather is likewise indicated by *dogs* becoming drowsy and stupid, and exhibiting an evident reluctance for food, except grass, (particularly the species denominated dog's-grass, or couch-grass); and by *cats* losing their vivacity, and remaining within doors. **Continued rain** is announced by *pigeons* returning slowly to their cotes; a change from cloudy or unsettled to greater wet, by *flies* stinging and swarming more than usual; and a sudden variation, accompanied with a storm, by *wild ducks, plovers, bustards*, and other *aquatic birds* withdrawing to the sea-coast, or to the marshes.

The contrary circumstances evince the longer or shorter continuance of fine weather; to which may be added, that *bees* flying abroad, and labouring with that industry which has become proverbial, *crows* croaking in the morning, the *robin* or *red-breast* singing early from the more elevated branches of trees, and *gnats* flying in a columnal form within the rays of the setting sun, are all indications of fine or serene weather.

II. **From the appearance of the earth.** Thus moist stones and dry soil prognosticate rain; a continued fall of which may be expected, if the ground seem nearly dry, and the roads almost, if not wholly, free from mud; as the con-
trary occurrences announce, that the evaporation of humidity has ceased, and consequently that fine weather is approaching.

III. From the atmosphere. If in the evening a white mist be spread over a meadow, contiguous to a river, it will be evaporated by the sun's rays on the following morning, and is an indication of fine weather throughout the day; so in the morning, if a mist, which is impending over low lands, draw off towards those which are more elevated, it announces a fine day. The gradual diminution of clouds, till they can be no longer seen in the air, is a sign of fine weather; so likewise does the continuance of abundant dew upon the grass after a serene day. The contrary events announce a change of weather, which may be more clearly known by the clouds gathering and lowering; by the sky, after serene weather, becoming undulated as it were with small clouds. During winter, if the clouds appear not unlike fleeces, i.e. thick and close in the middle, and very white at the edges, the surrounding sky being remarkably blue, they indicate hail or snow, or cold, chilling showers of rain. Farther, where the clouds appear moving in two opposite currents, and the lower current is wafted rapidly before the wind, it is a certain sign of rain; and, if they occur during summer, or generally in hot weather, they announce thunder-storms. If the rays of the sun break through the clouds, and are visibly dazzling in the air, the latter is loaded with vapours that will speedily descend in showers of rain. Thunder is mostly preceded by hot, and followed by cold and drizzling, or showery weather. Frequent variations of the wind to the different points of the compass evince the speedy approach of rain, particularly if it whistle or howl in its course through the atmosphere. The west wind is usually damp, on account of the vast quantity of vapours it collects in its progress over the Atlantic Ocean; the south wind, which blows from the torrid zone, is the warmest of the four, as the north wind is the
coldest, while the east wind is the most dry; but, if rain fall during the prevalence of an easterly wind, it may be expected to continue, with little intermission, for four and twenty hours.

IV. From the seasons.—1. A moist autumn, followed by a mild winter, is usually succeeded by a dry and cold spring, in consequence of which vegetation is materially retarded: such a spring occurred in 1741.—2. Should the summer be unusually cold and wet, the ensuing winter may be expected to be extremely cold; for the heat, or warmth, of the ground will be dissipated, or carried off, in consequence of such unusual evaporation.—3. Very wet summers are mostly attended with an increased quantity of seed on the dog-rose and white-thorn bushes; so that the uncommon fruitfulness of these shrubs may be regarded as a certain indication of an intensely-cold winter.—4. A severe winter is uniformly predicted by cranes and other birds of passage migrating early in autumn; for these creatures never take their flight southwards until the cold season has commenced in the northern regions.—5. Should frequent showers fall in September, it seldom rains in May; and the reverse. So there usually falls less rain in April than in October, in the proportion of one to two; in March than in November, in the proportion of seven to twelve.—6. On the contrary, should the wind blow from the south-west, during either summer or autumn, and the air be uncommonly cold for those seasons, a profuse fall of rain may be speedily expected.—7. A kind of crisis takes place in the atmosphere after great storms, rains, or similar violent commotions of the clouds, so that they are for some months attended with a regular succession either of bad or of fair weather.—Lastly, a cold and rough autumn prognosticates an intense winter; as the latter season, when rainy, is mostly succeeded by an unproductive year.

For the preceding remarks we are chiefly indebted to
an interesting tract, (which in fact every farmer should possess,) entitled "The Farmer’s and Gardener’s Directory, containing the most approved Rules and Directions for foretelling the Changes which take place in the Weather, &c." We shall conclude these hints respecting the atmosphere, with the following rules laid down by Mr. Kirwan, from observations which had been made in England, from A.D. 1677 to 1789, during a period of 112 years*.

1. When no storm has either preceded or followed the vernal equinox, the ensuing summer is in general dry, or at least so five times out of six.

2. If a storm happen from an easterly point on the 19th, 20th, or 21st days of May, the succeeding summer will also be dry four times in five. A dry summer will likewise follow, if a storm arise in any point of the compass on the 25th, 26th, or 27th days of March.

3. Should there be a storm either at south-west, or west-south-west, on any day from the 19th to the 21st of March, the ensuing summer will be wet five times out of six.

In England, if the springs and winters be dry, they are generally cold; but if moist or humid, they are usually warm; whereas, dry summers and autumns are mostly hot; as, on the contrary, moist summers are cold. Thus, if the moisture or dryness of a particular season be ascertained, an idea may be formed with tolerable precision respecting its temperature, and the farmer, by attending to the various indications of the weather, will be enabled to provide accordingly for the exigencies of his cattle stock.

* "Transactions of the Royal Irish Academy," vol. v.
SECTION I.

DISEASES INCIDENT TO CATTLE IN GENERAL.

§ 1. Black Quarter.

This malady, which is likewise known by the names of quarter ill, quarter eirl, black legs, highan striking, and numerous other epithets, affects both large and small cattle. The symptoms which indicate its existence (and from the suddenness with which the animals are seized, it cannot be discovered until it has actually existed for some time,) are, a crackling or swelling between the skin and the flesh, occasioned by a collection of air in the cellular membrane. The cattle that are taken with it fall in general suddenly, and die in the blood, as the expression in such case is, so that they become putrescent in a short time, and emit a most fetid smell.

The black quarter first appeared in the north of England, between fifty and sixty years since, when it committed great ravages, carrying off the fourth or fifth part of the live stock, chiefly young cattle from one to two years old, while aged beasts, with very few exceptions, escaped altogether. The cause of this malady appears to be a surfeiting of cattle with too much succulent, artificial grasses; hence it is obvious, that it can only be prevented effectually, by paying a due regard to the quality of the animal's food, and not to force them too much, with a view of speedy fattening. With regard to the cure, as this disease is usually so fatal and speedy in its issue, the earliest attention must be paid to it after discovery; with this view it has been recommended to resort to the use of rowels and setons, which, however, can only be applied with effect by an experienced farrier or veterinary surgeon; these being kept open for
some months, in order to discharge the peccant matter. Another remedy, that has been successfully employed, consists in letting blood plentifully in the first instance, and in scarifying the parts affected, and filling up the orifices with finely-pulverized saltpetre. The contiguous parts should also be fomented with applications of stale urine, hemlock, and fien's dung, in order to prevent the spreading of the inflammation. Throughout the course of this malady, the most prompt attention is necessary, on account of the sudden fatality of its termination; and, the treatment above mentioned will be materially assisted, by giving two or three brisk purges.

§ 2. Colds.

Colds are frequent attendants in the rearing of numerous animals, and are too well known to require any minute description. In these affections, as in every other malady, prevention is preferable to cure; it will, therefore, be necessary to preserve cattle from undue exposure to sudden blasts of wind, particularly from the north-east. When they become confirmed, or settle on some internal part of the body, the affected cattle may be easily discovered by the hollowness of their flanks, the roughness of their coats, the running or weeping of their eyes, and the heat of their breath. Colds prevail chiefly in the brute creation, as among mankind, in those springs which follow mild winters; and as they become contagious if long neglected, the diseased beasts should be selected as early as possible, and conveyed to a warm shelter or stable. Here they must be supplied with wholesome food; and, if the feverish symptoms increase rapidly, it will be necessary to take about two quarts of blood from the animal, except in the case of milch-kine. A warm drink, consisting of one quart of ale, with ginger, and a small portion of laudanum infused in it, should be given the beast, and the dose be repeated at the
expiration of six hours. The drink ought to consist of warm water, in which nitre is dissolved; and abundance of litter should be allowed. As the animal recovers, it must be gradually exposed to the air, till it becomes sufficiently hardy to be turned out among the herd.

§ 3. Colic, or Gripes,

may be ascertained by the restlessness of the diseased animal, which rises up and lies down almost incessantly, continually striking its head and horns against any object that occurs. Young cattle are chiefly affected by the colic; which is attended either with a scouring, or with costiveness, and which of course must be treated according to those two circumstances. In the former case, a warm draught should be given, consisting of one quart of ale mixed with a few drops of laudanum, and two or three ounces of oil of sweet almonds, or, which perhaps is preferable, with half a pint of olive oil, and sweetened with sugar. This draught is to be repeated at the end of twelve hours, or oftener, as the nature of the case may require. When the colic is accompanied with costiveness, the following purge should be given as early as possible: let four, five, or six drachms of fine Barbadoes aloes, and half a pint of brandy be mixed with two quarts of watergruel, and be administered in a tepid, or lukewarm state. In both cases, great and speedy attention is necessary, to prevent inflammation of the intestines, which must otherwise prove fatal; the beasts should also be kept warm and dry, in order to promote perspiration.

§ 4. Distemper, Murrain, or Pest.

This epidemic malady prevailed to a great extent on the continent, about sixty years since, and was introduced into England, where it carried off great numbers of cattle. The cause chiefly assigned, was the turning of the animals into
rank grass, after long continued showers, or a rainy season. The principal symptoms are, shivering and trembling of the limbs, accompanied by sinking of the flanks, difficulty of breathing, aversion to food (which continues in a crude state on the stomach for some days), dryness of the tongue, together with great heaviness and debility. Cattle affected with the murrain often shed tears, the eyes appearing sometimes dull and languid, at others sparkling and inflamed; their breath is fetid; and an offensive vapour issues from the body, that affects the surrounding air. Fever ensues for the first three days; eruptions take place on the limbs; and tumors may be discovered by the touch beneath the fleshy membrane. These various symptoms continue to increase till the seventh, sometimes to the ninth day, when the turn takes place.

Various remedies were recommended at the time the distemper raged in this country, the chief of which are, bleeding in the earlier stages of the malady, and the internal use of Peruvian, or, if this cannot be obtained, of oak bark, and good strong beer; or, should these fail, a mixture of bark and burdock, about half an ounce of each pulverized, may be given twice in the night, for two or three successive nights, in warm water, which will seldom fail to procure relief. Tar water, consisting of one quart of tar to a gallon of water, has likewise been administered with considerable success, in the proportion of three or four quarts, according to the size of the beast. Such a dose, however, should be given four times every day, and be gradually diminished, so that the beast never receive less than three pints, or half a gallon. During the whole course of the malady, the infected cattle should be warmly housed, and fed with good hay and warm gruel, pollard, or malt mashes. As they recover, they ought to be gradually accustomed to the air, lest too sudden exposure occasion other maladies.

After the disease is removed by the above treatment, it
will be necessary to fumigate the stables, or other places where the distempered cattle have been confined. For this purpose the following has been found useful: put one ounce of common salt in a varnished or glazed pipkin, and pour on it two ounces of spirit of vitriol, diluted with one ounce of water. Let the vessel be placed for one hour on a chafing dish full of live coals, in the centre of the building, so that the vapours may arise till the air is saturated. This process, however, ought to be repeated twice in twenty-four hours during the continuance of the contagion; but neither this, nor any other fumigation, can be productive of much benefit without the frequent admission of fresh air.

§ 5. Foul.

This disease affects the feet of cattle, chiefly in consequence of hard driving, where they travel through much dirt. The parts affected must be cleaned by washing, in order to discharge the offensive matter contained in the claws; after which they should be drest with a mild digestive ointment, and kept perfectly clean from all filth, or other extraneous articles. Some times, however, the foul becomes homely, in consequence of neglect, and though no material discharge takes place, is yet very painful; such indurations may be discovered by pressure with the hand, and must be removed with the knife, attention being paid to the directions above stated.

§ 6. Hoven.

No distemper is of more frequent occurrence among cattle than that of being swollen, that is blown or hoven, as it is usually denominated by farmers. It is induced either by exposure to damp situations, by too sudden removal from an inferior to a rich pasture, or by their eating too eagerly of turnips, clover, or any other succulent food; thus the stomach is loaded with food, and the process of
rumination, or chewing the cud, being prevented, the animal becomes swollen with confined air, which penetrates into the stomach and intestines. Its preventive is obvious, and consists simply in turning cattle into such rich pastures only when they are not pressed by hunger, so that their appetite may be soon gratified; or they should be gently driven about for a few hours, that the dew may not only have time to evaporate, but also the animals being thus suffered to graze a very short time at once, their stomachs will become gradually accustomed to it.

Various remedies have been tried and recommended for this malady, which, if not opportuneley discovered, inevitably proves fatal. Of these, the most common is to make an incision with a pen-knife beneath the short ribs, when a quill, or small tube of ivory or smoothed elder, is introduced, in order to give vent to the confined air; the wound is then covered with adhesive plaister, to prevent it from being-affected by the external cold; and thus the danger is in general quickly removed.

The method here noticed appears to be the result rather of absolute necessity than of mature thought, though sanctioned by custom; and, as it is liable to be attended with fatal consequences through the ignorance or inexpertness of the operator, it becomes necessary to resort to more easy remedies. Medicines indeed are seldom of any particular service, on account of the distance to which country people are often obliged to go in order to procure them; but the following recipe, (which we communicate from Mr. Young's "Annals of Agriculture," vol. xxxiii,) being composed of simple, cheap, and common ingredients, promises to be useful. Let three quarters of a pint of olive oil and one pint of melted butter, or hog's lard, be mixed together, and given the animal by means of a horn or bottle; if no favourable change be produced in a quarter of an hour, the same quantity may be repeated. This dose is calculated for
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neat cattle; for sheep, when hoven or blown, a wine-glass full and a half, or two glasses, will be sufficient to be given in like manner. And it is asserted in the communication above cited, that this remedy is a specific for the malady in question, effecting a cure within the short period of half an hour.

Various instruments have likewise been contrived, with the view of relieving hoven cattle, two of which merit to be particularly noticed. The first of these is a flexible, metallic tube, invented by the celebrated professor of anatomy at Edinburgh, Dr. Monro; by whom it was announced to the public in 1793. It consists of iron wire, about one-sixteenth of an inch in diameter, twisted round a polished iron rod, three-eights of an inch in diameter, in order to give it a cylindrical form; the wire, after being taken off, should be covered with soft, smooth leather. To the end of the tube, which is intended to be passed into the stomach, a brass pipe, two inches long, of the same size as, or rather larger than, the tube, is to be firmly connected; and, to prevent the tube from bending too much within the mouth or gullet, an iron wire, one-eighth of an inch in diameter, and of equal length with the tube, is placed within it, and withdrawn when such tube has entered the stomach.

Dr. Munro has found, that the distance from the fore teeth to the bottom of the first stomach of a large ox is about six feet; the tube ought, therefore, to be six feet, or two yards in length, in order that it may operate effectually with the largest oxen. When the tube has entered the stomach, it may continue there for any length of time, as it does not impede the respiration of the animal. The greater part of the confined air will be discharged through the instrument; and, in case it should be thought necessary, the remaining condensed air, or of the superfluous moisture in the stomach, may be absorbed thence by fixing a bellows to the upper end of the tube, with two valves, one at the muz-
zle, the other at the side of it, and so disposed as to allow the air to pass in the direction from the stomach upwards. At the same time, should it be deemed advisable to inject any ardent spirits, or other liquor calculated to check the fermentation, that operation may be performed with the utmost safety through this tube.

Equally useful with the flexible instrument of Professor Monro is the instrument invented by Mr. Eager, for relieving hoven cattle and sheep; for which the Society for the Encouragement of Arts, &c. in 1796, voted to him a premium of fifty guineas, for communicating his simple and useful contrivance to the public.

The letters A A represent the knob of wood, and part of the cane to which it is attached, of a proper size for
oxen, or other large cattle; the length of such cane should be six feet.

B B is the knob of wood, and part of the cane, calculated for sheep; its length ought to be three feet.

When any beast is swollen, or hoven, Mr. E. directs a person to lay hold of it by the nostril and one horn, while an assistant steadily holds the tongue with one hand, and with the other pushes the cane down the animal's throat. Attention must, however, be paid, that the animal does not get the knob of the cane between his grinders, and that it be thrust down to a sufficient depth, because its whole length will do no injury. As an obstacle will occur at the entrance of the paunch, the cane should be pushed with additional force; and, as soon as a fetid smell is observed to issue from that place, and the body of the beast sinks, the cure is performed, and nature will complete the rest.

Mr. Eager, in his communication to the respectable society above mentioned, adverting to the cause of this disorder, attributes it to the superabundance of air introduced into the stomach by eating too large quantities of succulent food at one time, which occasions a more than usual portion of air to ascend from the paunch of the beast. This forces the broad leaves before the passage at the end of the stomach, as these leaves prevent the wind from passing upwards in its regular course. Consequently the paunch begins immediately to swell; the air becomes rarefied by the heat of the body, so rapidly as to impede the circulation of the blood; and the beast, whether ox, cow, bullock, or sheep, inevitably expires in half an hour, unless speedy relief be procured. It only remains to add, that Mr. Eager's plan and instruments have been sanctioned by the Earl of Egremont, as well as by several eminent farmers, who have attested its efficacy in relieving blown or hoven cattle.
§ 7. Inflammation of the Liver.

A variety of causes may concur to produce this malady. In some cases it is occasioned by overdriving fat beasts during summer; in others, by bruises or blows that impede the circulation, and produce an inflammation of the liver and contiguous parts, which, if not timely regarded, will prove fatal; while, in other cattle, this malady appears to be hereditary. The symptoms indicating the existence of this disease are, fever accompanied with difficulty of breathing, a swelling near the shorter ribs, and in cows a remarkable distention about the uterus, or womb; in short, cattle affected with an inflammation of the liver have a universally bad habit of body, and never fatten; which last circumstance may be considered as a certain sign that the livers are not in a sound or healthy state. With regard to cure, it has been recommended to bleed the animal profusely, and to give the following medicine in a tepid state, viz. saltpetre and Glauber's salts, of each two ounces; Venice treacle, mithridate, and white ginger pulverized, of each one ounce; let these ingredients be boiled in three pints of water, in which may be gradually added one gill of oil of sweet almonds, the whole being carefully stirred and incorporated together. This quantity is sufficient for one dose, which should be administered in the manner already stated, and be repeated the succeeding day. Warm mashes of bran ought to constitute the chief article of food, and may be given at intervals between the two doses, being afterwards regulated according as the beast may require them. It should, however, be observed, that where inflammation of the liver is hereditary, no powers of medicine can, in general, afford any relief, much less effect a speedy or permanent cure.
§ 8. Inflammation of the Lungs.

This disease is likewise called pleurisy, or peripneumony, and is known by a difficulty of breathing, attended with a dry and painful cough, or hooping; the animals have a peculiarly heavy, dull look; a copious discharge of thick, ropy phlegm issues from the mouth; and the hide is hot and harsh. The causes of inflammation of the lungs are various; sometimes it is produced by the animal’s eating acid vegetables; at others, by the suspension, or total checking of perspiration by sudden changes from heat to cold, particularly after a continuance of hot weather, which is succeeded by easterly winds. As this malady is extremely violent and fatal in its effects, it will be necessary to bleed the affected beast pretty freely, though not so profusely as to reduce the system too low. Purgative, cooling medicines should then be administered; with this view the following preparation has been recommended by Dr. Bartlet, to be given twice in the day, in doses consisting of half or a whole pint. It is prepared by infusing eight ounces of finely-pulverized glass of antimony in four quarts of strong beer, in a stone bottle, for a fortnight; thoroughly shaking the mixture every day; or the following may be given:—Let flour of sulphur and of liquorice, of each one ounce, be boiled in a quart of water; and, when nearly cold enough to be administered, two ounces of oil of sweet almonds, a similar quantity of syrup of coltsfoot, and one ounce of balsam of sulphur, may be gradually incorporated. This quantity is sufficient for one dose; either it, or the antimonial beer above mentioned, may be given after bleeding, and washing away all the mucus, or slimy phlegm, from the tongue and mouth with salt and water. It will be necessary to house the diseased beasts, which should be supplied with sufficient litter. In case the treatment already stated should not produce any visible alteration, it may be repeated at the end of about eight hours;
and it will be beneficial to give the beast a little gentle exercise, if possible; or if not, to rub the legs with a wisp of straw, which will contribute to promote the circulation of the blood.

§ 9. **Locked Jaw**, or *spasm*, as it is sometimes termed, is one of the most distressing maladies to which cattle are subject. Its causes, as in mankind, are chiefly sudden colds, and wounds in the tender parts of the animal frame. The treatment of it is likewise similar to that in the human frame: if the beast be of a weak or delicate habit of body, warm bathing and fermentation of the part affected, together with opiate frictions, have been found eminently useful. Where an animal is of a hardy, robust constitution, opiate frictions and cold bathing, or dashing of cold water, may afford relief; and, as no food can be taken by the beast during the continuance of this malady, it may be advisable gently to *horn in* warm mashes, barley or rye gruel, to supply nourishment till a cure can be effected.

§ 10. **Looseness, or Scouring,** affects both oxen and cows, though its causes in both are different. In general, it arises either from want of sufficient food, both in quality and proportion; from being overheated, or overworked; by feeding on wet, unwholesome fog, or after grass; by not being lodged in dry situations; sometimes from giving them too large a quantity of cut hay or straw hotter than their natural temperature; though it is sometimes a hereditary taint, and in cows is caused by their taking cold while calving. But whatever be the cause, as soon as the scour or lax begins to appear, (and it may be easily known by their general debility and loss of flesh, the increasing paleness of their eyes, and irregular beating of the pulse, weakness of appetite, and fre-
quent discharge of slimy excrement,) it will be necessary to house the beast, and put it to dry food; which, in early stages of the disease, will mostly effect a cure. Should the looseness increase, a pound of mutton suet, boiled in three quarts of milk till the former is completely dissolved, may be given in a lukewarm state, which will contribute to allay the soreness necessarily occasioned by the continual irritation of the abdominal vessels. Or, in cases of obstinate scouring, the following drink may be beneficially administered: let half a pound of grossly-pulverized tormentil root be boiled in two quarts of water, till this is reduced to one quart; strain it off; add a quart of red wine, a quarter of a pound of finely-powdered chalk or whiting, and two ounces of diascordium, without honey. This mixture should be preserved in a bottle, and well shaken together; it will be proper to make it lukewarm before it is given. The dose is half a pint, to be administered three times in the day, at nearly equidistant periods, till the beast recovers. Or, in similar cases, the following preparation may be given with equal, if not superior advantage: boil half a pound of pulverized common chalk in two quarts of water, till the latter is diminished to three pints; then add four ounces of hartshorn shavings and one ounce of cassia, stirring the whole carefully. When the decoction is cold, two drams of Thebaic tincture, or tincture of opium, and one pint of lime water are to be added; the whole should be kept closely stopped in a bottle, being well shaken before it is used: the dose is one or two hornsful, to be administered two or three times in the course of the day, as the nature of the case may require. But, where a hereditary taint, or debility, is the immediate cause of the scouring rot, as this malady is sometimes termed, it will baffle all the powers of medicine.
§ 11. Mortification.

A disease, to which this name has been given, has for the last ten years prevailed in the state of Connecticut, where it has proved peculiarly fatal to horned cattle; we, therefore, deem it necessary to state its symptoms and causes, in case this island should be ever visited with the malady in question.

The mortification is chiefly confined to cattle under three years; sometimes it attacks cows, more rarely oxen; but is chiefly fatal to calves in autumn, and to yearlings in the months of May and June: the highest fleshed and largest animals are the most liable to this disease. Its symptoms are, aversion or unwillingness to move, a soft swelling in the leg, shoulder, flank, or side, but more frequently in the back and region of the kidneys. In the course of six, twelve, or twenty-four hours, the creature's existence terminates, with little expression of pain; but an almost intolerably fetid smell arises just before death, and afterwards, on skinning the beast, the swollen spot is found to contain a jelly-like matter and black blood.

The cause of the malady is supposed to be too much fulness, or plethora, as it proves destructive to cattle after a change of pasture or fodder, from bad to good; and it is stated, (in the "Medical Repository of New York," vol. i,) that many calves have died after feeding in fields of grain.

The remedies are chiefly of the preventive kind, viz. bleeding, or a change of pasture of a better quality, especial care being taken not to permit a sudden change from a bare to a full bite. One person bled copiously in the neck, gave the animal his own blood to drink, which produced purgative effects; and then made an incision in the swollen spot, whence the jelly was extracted, and the cavity was filled with rum and salt. Three head of cattle,
thus treated, recovered; but, on all the rest, this manage-
ment had no effect, either good or bad.

§ 12. The Pantas, Panting-evil, or Pantasie,
prevails chiefly during the intense heat of summer,
though it is sometimes occasioned by sudden colds. It
may be easily known by the panting, or heaving, of the
animal's flanks, which is likewise accompanied by trem-
bling and decay of flesh. In the treatment of this disease,
it will be necessary to house the beast, and to give him
every six hours (during the continuance of the chilly
symptoms) one quart of warm strong beer, in which one
table spoonful of laudanum, a similar quantity of ground
or grated ginger, and two table spoonsful of spirit of harts-
horn have been previously infused. His food should con-
sist chiefly of sweet, dry hay, with warm water, in which
nitre may be dissolved, if a fever be approaching; and the
animal should be well littered with abundance of straw.
As he gains strength, he should be gradually accustomed to
the air, and after a short time will be fully recovered.

§ 13. Poisons.

While grazing abroad, cattle are subject to a variety of
casualties or accidents, by eating the leaves of yew, various
species of crowsfoot, and other acrid plants, as well as by
bites from mad dogs, or other venomous animals. In the
former case, the most effectual practice consists in drench-
ing the animal with a mixture of equal parts of lukewarm
salad oil and vinegar, afterwards giving a gentle purgative
of Glauber's salt, or Socotrine aloes; and, if the viscera
appear preternaturally distended with air, by administering
a tepid infusion of tobacco in the form of a clyster, though
the application of Dr. Monro's elastic tube, already de-
scribed, p. 179, has in some cases been attended with suc-
cess. With regard to bites of mad dogs, the only certain
remedy is to eradicate the lacerated part, either by excision or by the actual cautery, the wound being kept open for a considerable time; but in cases of bites by serpents, vipers, or other venomous reptiles, we know of no better remedy than the continued and copious use of spirit of hartshorn, both as an application to the part affected, and also internally as a medicine.


The name of this malady sufficiently indicates its nature, so as to render a specific description of it unnecessary; it may be easily discovered, in recent cases, by the animal’s making frequent but fruitless attempts to discharge urine; but when they make much and frequent, with a considerable effusion of blood, it is a dangerous symptom. Cattle, thus affected, usually leave the herd; extending their tails, they apparently feel pain in the urinary canals, and not unfrequently set their backs up higher than common.

The red water chiefly attacks young beasts, and is caused either by sudden changes of weather; eating acrid or prickly vegetables that puncture the smaller blood vessels, and consequently produce the bloody discharge; by bad or coarse food; and likewise by bad or stagnant water.

As soon as a beast is discovered to void blood, it should be conducted to a warm, dry shelter, and kept on good hay, or similar dry food; formerly, and in many places the custom still prevails, it was the practice to drench the animal with a pound of Glauber’s salts, repeating the dose on the following day. But such violent remedies are by no means calculated, in our opinion, to operate as a styptic, to prevent the discharge of bloody urine; on the contrary, they rather tend to relax the animal, (already sufficiently weakened,) in a yet greater degree. We would, however, prefer a strong decoction of Peruvian bark, (for which oak bark may be substituted if necessary,) in which a small
quantity of alum has previously been dissolved. The dose may be two or three hornsful, to be given twice or thrice in the day, at nearly equidistant periods, accordingly as the violence of the disease may require.

§ 15. The Staggers.

This disorder is variously known by the names of daisey, dizziness, epilepsy, lethargy, turning or vertigo, that sufficiently indicate its symptoms, the chief of which is a lethargic drowsiness, accompanied with a wavering, unsteady, and staggering gait. The seat of this malady is either in the brain or in the stomach; in the former case, it is usually produced by hydatids, or small transparent bladders filled with water, or by some other matters immediately acting upon the brain. Where this is the inducing cause, medicine can afford no assistance whatever, but we remember an instance of epilepsy which occurred many years since, where this formidable disease was cured by the operation of trepanning, which was performed by Mr. Cheston, an expert surgeon, then residing at Gloucester*. But where the staggers is caused by plethora, or too much fulness of blood, bleeding, and cooling purgative medicines should be resorted to; and, as it is necessary to confine the beast in a warm stable or shelter, it will greatly contribute to promote the circulation, thus necessarily stagnated for want of exercise, by rubbing him every day with dry straw, and allowing him plenty of litter to promote perspiration.

§ 16. Wounds.

Cattle, in general, are subject to a variety of accidents, which the limits of our work forbid us to specify, and

* For this interesting fact we are indebted to the excellent "Practical Essays," published in the year 1772, by Dr. Lysons, of Bath.
which indeed are so numerous, that it is scarcely possible for human foresight to provide for every contingency. Hence our remarks will be confined to the most appropriate remedies for punctures, bruises, or common wounds.

In cases of common, fresh wounds, nothing is more necessary than to apply a salve, consisting of white lead and oil of turpentine, incorporated together with a little brandy, to the lips of the cut, which should be drawn as closely together as possible; and carefully to exclude the air. But if the laceration be deep, it must be washed with warm milk and water, and the ragged flesh, if any, cut out with a sharp knife; after which the wound may be filled with lint or tow, dipped in the following digestive ointment, viz. Mix Venice turpentine and balsam of copaiba, or capivi, of each one ounce, with two ounces of yellow balsam. The wound must, as in the former case, be kept free from air and dirt, as its healing will be materially retarded.

The following remedy has been recommended as a certain styptic for fresh wounds: bruise equal parts of stinging nettles and salt in a mortar, till a pulp or mash is formed, and apply it to the wound; the bleeding of which, it is asserted, will immediately cease, however deep or dangerous such wound may be. Not having had experience of its efficacy, we cannot vouch for its utility; but as the articles are always at hand, this specific, if such it be, certainly deserves a fair trial. Where, however, an animal has received any blows or bruises, without breaking the skin, it will be sufficient to bathe the part affected with camphorated spirit of wine; but if the swelling become inflamed, it will be requisite to make a slight incision below the contused spot, in order to promote suppuration, after which the following salve, or plaister, may be applied. Let frankincense and Venice turpentine, of each one ounce, be gradually incorporated over a slow fire, with two
ounces of Burgundy pitch; and, when of a proper consistence, let a sufficient quantity be spread upon a pledget of tow or strong linen rag, and well fastened on with a bandage. As soon as the wound begins to discharge the matter freely, the digestive ointment and treatment just mentioned may be adopted. Lastly, should any swellings or local humours arise, without the beast receiving any external injury, or if the skin should be very slightly bruised, they will be effectually removed by applying Goulard’s mixture, which is prepared by adding two tea spoonsful of extract of lead, and one large spoonful of strong camphorated brandy, to one pint of water; the whole is to be well shaken together and set apart for use.

§ 17. The Yellows, or Jaundice,
is a slow, languishing complaint, incident to all sorts of cattle, and is uniformly caused by obstructions or affections of the liver. It is most to be apprehended for about five weeks in the beginning of spring and autumn, when the days are mostly warm and the evenings chilly and cold; the grass being also, at those times, extremely succulent, cattle are, if not attentively watched, apt to eat too freely.

The existence of this malady is evinced by the yellow tinge prevailing in the mouth and eyes, and sometimes the whole body assumes a yellow cast; the nose is dry, (a material point to be attended to in cattle-medicine, as a humid nose is an infallible sign of health); the udders of cows, especially if they have taken cold, become swollen, and yield but little milk, which also acquires a yellow hue, and curdles on being boiled; and not unfrequently the fore teeth become so loose as to be in danger of falling out.

When the yellows, or jaundice, is discovered, the beast should be taken home as soon as possible, and two or three gentle purgatives administered; after which a cordial drench may be prepared in the following manner: Let
three or four ounces of steel or iron filings be infused, for three or four days, in four quarts of good strong beer, in a stone vessel, which should be closely stopped up for three or four days, being carefully shaken every day. One pint of this, in a tepid or lukewarm state, may be given twice daily; and considerable benefit is said to have been derived by dissolving about one ounce of soap in a quart of such drench, care being taken to supply the animal with good keep, consisting of warm mashess of malt, bran, or barley meal, in which a little salad oil may be mixed, if there be any indications of costiveness.

It ought, however, to be remarked, that if any hepatic inductions, or schirrous tumours take place in the liver, the disease becomes more confirmed, and at length degenerates into an inveterate complaint, denominated the black jaundice, which no medicine can remove.

SECTION II.

DISEASES PECULIAR TO COWS.

§ 1. Cough, or Hoosing.

This disease may be easily known, by the shortness of breath and difficult respiration that invariably accompany it. Sometimes it arises from extraneous matters adhering to the throat, which, resisting the powers of mastication, produce an unusual tickling in that part; but more commonly it originates from cows taking cold while calving. A regular supply of sweet, succulent food, together with warm housing, (especially during the winter), is the only certain remedy that can be depended upon in this case; though some have recommended one ounce of pulverized aniseed, a similar quantity of tar, and of vinegar of squills, to be infused in a quart of warm ale, sweetened with honey.
DISEASES OF COWS.

With this liquor the animal must be drenched every day for several weeks, otherwise no beneficial effects can be expected to be derived from such treatment.

§2. Difficult Parturition

occurs in consequence of the fetus being in an unnatural position, i.e. in an unfavourable situation for extracting the calf at the moment of birth. As it is impossible to notice every unnatural position that may take place, we shall here mention only a few of those which are of most frequent occurrence. Sometimes the calf-bed or lye becomes horned: that is, the passage is so contracted and sinewy as scarcely to admit the smallest hand, or even a finger. As many cows have died for want of attention to this circumstance, it becomes necessary to watch them at the close of the period of gestation; and, if the usual symptoms of calving appear, and the beast be unable to drop her burden, it will be proper to introduce a small hand, previously anointed with fresh butter, tallow, or similar unctuous matter, to prevent irritation, in order to ascertain whether the passage be closed up or not, as already stated. Should the hornig of the lye be discovered, and it be certainly known that the cow has gone her full time, recourse should be immediately had to the following operation:—Let a small, sharp knife be provided, the blade of which does not exceed one inch and a half in length, and having an indentation, or hollow, on the back part of the point, for the more easy guidance of it with the fore finger. This must be carefully introduced by a steady hand, the fore finger being pressed uniformly forward, to prevent any accident that might otherwise arise from the edge of the instrument. As soon as the sinewy or horny circle is divided, the cow will find immediate relief, when every assistance should be rendered to extract the calf from the uterus; the wounded part being afterwards bathed with a
pint of camphorated spirit of wine, that may be injected by
a syringe. The beast should be kept moderately warm,
and supplied with sufficient dry, wholesome litter, and
sweet, nourishing food. This treatment is preferable to
removing the calf out of the animal's side by excision,
which is usually termed the Caesarean operation; a dan-
gerous practice adopted by some, but which may, we think,
be rendered unnecessary, by duly watching the cows at the
end of the period of gestation.

Other cases of unnatural position, however, are less
complex, and more easily removed. Thus, if the foetus
present itself in its due posture, with only one foot left be-
hind, this may be easily put into its place; but, if both feet
be left behind, so that the head only appears, they must be
restored to their proper situation before the cow can be
safely delivered of her burden. In like manner, where the
position of the calf is totally inverted, so that the fore feet
occupy the place where the back ought to be; the latter
should, if possible, be placed in the same direction with
the back of its dam. For this purpose the greatest atten-
tion is necessary, to raise the hinder parts of the cow, in
order to relieve her, and facilitate the placing of the calf in
its proper situation. Farther, it sometimes occurs, though
rarely, that the hinder parts of the calf first present them-
selves; in such case, if this be the only variation of posi-
tion, it will be preferable to deliver the calf, if practicable,
rather than put the dam to unnecessary pain by attempting
to transpose the ends. Where, however, the shoulder, or
any other part, appears at the mouth of the womb, no pre-
cise directions can be given; in fact, the success or failure
of the case depends entirely on the skill of the operator, in
ascertaining what part may be brought forward with least
pain to the cow; and in seizing those situations and posi-
tions which are most favourable for this purpose. After
the calf is safely delivered, the cow and her offspring may
be treated in the manner already stated, p. 19, 20, and following.

§ 3. Farthing-bound.

This disease is, we believe, chiefly confined to the Weald of Kent, and the neighbouring parts of Sussex. It is a peculiar stoppage in the bowels, that causes the feces to dry up in the intestines, whence it is sometimes called knit. For, by the motion of the intestines, one of them, or part of it, is surrounded with a strong ligament that totally impedes the passage, and adheres to the inside of the loin. The indications of this malady are, loathing of food, and frequent moving of the hinder legs inwardly and up towards the belly. The only remedy at present known is, to throw the beast on the ground, and make an incision in the flank, of sufficient width to admit a hand; by this means the operator will be enabled to discover the ligament, which must be immediately separated with the thumb nail, when the intestine will be released, and returned to its proper position. The incision may then be sewn up, and the cow will, in a short time, perfectly recover.

§ 4. Puerperal, or Milk Fever;

is chiefly occasioned by cows taking cold while calving. Hence it becomes particularly necessary to watch them; when near their time of calving, as many valuable beasts are lost for want of due attention to this circumstance. Cows thus affected should be taken into the house, their heads being placed highest, in order that the natural discharges may take place without inconvenience. They should be allowed plenty of dry litter, and in other respects generally treated as in the case of violent colds, (which have already been discussed, p. 174,) excepting that no blood must, on any account, be drawn, unless in cases of extreme necessity.
§ 5. Falling down of the Calf-bed.

This usually occurs after a laborious birth, when the cow is more than usually fatigued, although some beasts are naturally disposed to such weakness. Where the falling down of the calf-bed is apprehended, the cow ought to be carefully watched; and the placenta, or cleaning, should be removed, if possible, without effusion of blood; after which the operator may gently replace the calf-bed, taking care not to withdraw his hand till the former begins to feel warm. The following draught may then be given: let bay-berries, pulverized gentian root, and coriander seeds, of each one ounce; aniseeds and juniper berries, of each two ounces; and half a pound of treacle be given in three pints of good strong beer; after which lead the cow gently down a hill, if there be one adjacent, as the motion will greatly contribute to replacing the calf-bed in its proper position, and render the application of stays to the womb unnecessary. Where beasts have a peculiar construction, favouring this malady, it may possibly be prevented when the period of gestation is nearly expired, by extending their stalls so as to favour their lying down; but where the calf-bed comes down, and no immediate aid can be procured, it should be deposited on and covered with a clean linen sheet; the irritation thereby produced being considerably less than that of the air, litter, &c.; and when it is replaced, those parts which have been so exposed should be bathed with new milk and brandy, rum, or spirit of wine, after which the treatment above mentioned may be pursued.

§ 6. Affections of the Udder.

The udders of young cows, that are in high condition, are sometimes greatly swollen and inflamed for several days before they calve, in which case it will be proper to milk
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them repeatedly, and alternately to anoint the distended udders with cooling ointment and brandy. Beside these swellings, the udders of cows are liable to injuries, which are often of serious consequences, by falls, blows, wounds from sharp or pointed instruments, by the violent sucking of calves, and also from the injudicious or rough treatment of harsh or inexperienced milkers. While the inflammation remains in an indolent state, the parts affected ought to be repeatedly anointed in the course of the day with fresh butter, or with a salve, consisting of one ounce of Castile soap dissolved in one pint and a half of new milk over a moderate fire, constantly stirring it till it be thoroughly incorporated. An ointment, prepared from the juice of the leaves of the common thorn-apple (Datura Stramonium, of Linnaeus,) mixed with hog's lard, is likewise said to be an excellent application for swollen udders; or, the tumour may be anointed with a little mixture, consisting of camphor and blue ointment, about half a drachm of calomel being given in a hornful of warm beer, for three or four mornings, if the malady continue to increase. Where, however, the udder and teats are considerably inflamed, internal remedies should be resorted to: for this purpose it has been recommended to mix four ounces of nitre with one pound of common salt, and to give two table spoonsful of the powder in a gallon of thin water-gruel every three hours.

But in case the disorder should, from neglect, have made such progress as to exhibit hard tumours, the following fomentations may be applied. Let one handful of common hemlock (Conium Maculatum, L.), a similar quantity of the dwarf, or round-leaved mallow (Malva rotundifolia, L.), and the same portion of common melilot (Trifolium melilotus officinalis, L.), be boiled in a sufficient quantity of water and diligently applied, as warm as the beast can bear it. As soon as the tumour opens, let the
sore be properly cleansed, and then cover it with a plaister of Turner's cerate, or of Basilicon ointment. The annexed remedy has also been successfully employed in obstinate cases of ulcerated udders, viz. take gum ammoniac and gum galbanum, Castile soap, and extract of hemlock, of each one ounce; form them into eight boluses, one of which should be given every morning and evening.

Lastly, where the teats only are sore, they may be washed with clean, warm soap-suds, and rubbed with an ointment consisting of pulverized ceruse, or white lead, that has previously been saturated with brandy, mixed with a sufficient quantity of goose-grease, or elder ointment.

SECTION III.

DISEASES OF CALVES.

§ 1. The Cords.

This disease is chiefly prevalent in Scotland, where it attacks calves during the first days or weeks after they are produced, and proves particularly fatal to such as are fed by hand and confined; though, if they outlive five or six weeks they are seldom in any danger. The disorder appears to be of a plethoric and inflammatory nature, as the calves that die in consequence of it are extremely red; and the small leaders, or ligaments, are much contracted, whence probably the disease has its name. With the view to prevent the occurrence of the cords, it has been recommended to purge off the meconium, or first excrement, by giving the calf a little of the mother's milk, lukewarm, as early as possible, care being taken that no cold milk be given the animal for the first six weeks. And, in order to counteract or reduce such plethora, it will be advisable to turn them out every day for a few hours, as soon as possible.
after they are calved, in order that they may enjoy the benefit of full and free exercise in the open air; but, where the weather or other circumstances may not allow this always to be done, (and especially as confinement is necessary to their speedy fattening) the most effectual preventive of this mortality will be frequently to take a little blood from them.

§ 2. Cough.

Where calves are exposed at too early an age to all the vicissitudes of the weather, before they acquire sufficient strength to undergo the changes of this climate, they are liable to take frequent colds; the consequence of which is a cough, that often proves fatal if it be neglected. For curing this malady, it has been recommended to pour half a table spoonful of spirit of turpentine into the calf’s nostrils, which must be held upwards, in order that the turpentine may flow into the throat; at the same time, the nose should be smeared with tar, and the animal kept within doors for a few hours, repeating this treatment as often as the cough is troublesome.

§ 3. Garget.

This disease mostly attacks yearling calves, at an early period of the year. It is supposed to be analogous to the rheumatism in the human body, and is occasioned by lying wet, either in the yard or in fields. To be kept perfectly dry is an almost certain preventive; and, where the garget has taken place, the beast must be kept as warm as possible; and, perhaps, relief may be obtained by bathing the legs in warm water for a little time.


chiefly prevails in the county of Hereford, where it is considered as the effect of an enormous method of castration,
which causes a stoppage in the bowels, and brings on a mortification that speedily proves fatal. The symptoms are a total stoppage in the bowels, except a copious discharge of blood and mucus, accompanied by a violent fever, which occasions the calf to kick at its belly, lie down, and groan. The gut-tie mostly affects calves, though they may live to be full aged, and yet be liable to a sudden attack of this distemper. The manner in which a cure is effected in the county above mentioned is, to make a perpendicular incision four inches under the third vertebrae of the loins, over the paunch, or stomach, and to introduce the arm, in order to discover the part affected, the beast being kept, if possible, in an erect position by the help of proper assistance. In order to remove the stoppage of the stomach occasioned by the gut-tie, and to carry off the fever, one ounce of senna, two ounces of cream of tartar, and four ounces of Glauber's salts, infused in two pints of boiling water, are given, with the addition of half a pound or pint of salad oil, the whole being worked off with gruel, in which mallows and alder bark have been infused.

§ 5. Scouring, or Looseness,
is generally the first malady that attacks calves: it is mostly, if not entirely, occasioned by the inattention of the persons to whose care the sucklings are committed; and who often put them too soon to suck, allowing them to remain longer at the teat than is proper: too frequent change of milk will likewise produce this disease. As soon as the looseness is discoycred, it has been recommended to stint the calf in its diet, and to give an egg, boiled hard and chopped small by drenching, fasting; the use of which, once or twice, is asserted in most cases to effect a cure. And in the "Annals of Agriculture," vol. xix, a correspondent recommends a mixture of pulverized chalk and.
wheat-meal, made into balls with gin, as a medicine, which may be administered with safety.

§ 6. The Shoote.

This is a most fatal malady to calves, which it generally attacks a few days after birth. The usual symptoms are, first, a colic that is more or less violent, and is frequently very severe and dangerous, especially when it is contagious. This colic is terminated, and the calf relieved by a discharge taking place from the bowels; though this sometimes proves fatal before the shoote appears. Secondly, a loathing and refusing of food, even previous to the discharge, which decreases and increases according to the duration and violence of the disorder. Where the shoote prevails, the cheapest, and perhaps the best, medicine which has been generally administered by experienced breeders is, eggs and flour properly mixed with oil, melted butter, and aniseed, linseed, or similar mucilaginous vegetables; or, simply, milk well mulled with eggs, may be given to the distempered animal.

SECTION IV.

Diseases peculiar to Oxen.

Oxen are subject to few maladies, exclusive of those incident to neat cattle in general, unless the effects produced in these animals by the ox-fly, breeze, or gad-fly, as it is variously termed, (the Oestrus bovis of Linnaeus). This insect has spotted wings and a yellow breast; it is furnished with a long proboscis, armed with a sharp dart, inclosing two others within it. The gad-fly particularly infects oxen, in the backs of which these insects deposit their eggs, and in which the maggots are nourished during the month of
June: throughout the summer they plague the cattle by means of their darts to such a degree, that they are often induced to rush into the water for relief, till the approach of night. It has been suggested, that the production of these terrible insects might be greatly checked, if not prevented, by washing oxen and cows, (which are sometimes attacked by these vermin) in the spring, with a decoction of tobacco, or any other bitter and acrid vegetable.

SECTION V.

Diseases of Sheep.

Sheep are subject to various disorders, of which, however, our limits allow us only to state those of most frequent occurrence; hence we shall, for the present, briefly remark, that it may be easily ascertained whether these animals are in health, or diseased, by their agility and briskness; the clearness of their eyes, which, as well as their noses, are perfectly dry; by the sweetness of their breath; the coolness of their feet; regularity of perspiration; the fine red colour of their skin; soundness and firmness of their teeth; and by the uniform, unbroken texture of their wool.

§ 1. Blindness.

This affection of the eye is produced by exposure to cold, particularly in too moist or too elevated situations. It prevails chiefly in Scotland, where a cure is sometimes attempted ("Agricultural Report of the County of Perth," 8vo. Ed.), by opening the angular vein of the eye, and holding the animal's head in an inverted position, so that some drops of blood may fall into the eye. This mode-
Diseases of Sheep.

rates the increased action of the vessels of that part, which is the immediate cause of inflammation; and also the blood, being so admitted into the creature's eye, will, in consequence of its mildness and warmth, produce emollient effects, which likewise contribute to promote a cure. This operation completely removes the white specks on the eye, and restores the sight; though some for this purpose pulverize a small quantity of glass, and blow it into the eye by means of a quill, open at both ends, which, by its friction, wears off such specks or scales.

§ 2. The Blood

is a fatal malady to sheep, which often die suddenly in consequence of it: in less violent attacks the symptoms are, panting and heaving of the flanks, and standing still. It is produced by feeding on too succulent or moist pastures. The most effectual remedy is bleeding; after which the animal should be turned into a dry pasture, and a mixture of common salt and nitre with bran may be given to it.

§ 3. Dunt.

This disease is variously known by the names of staggers, giddy, vertigo, turn, sturdy, and bladder on the brain. It is occasioned by a vesicular collection of water in the head, between the dura and pia mater, and uniformly produces a continual giddiness. The violently pulling of sheep by the ears, which are afterwards cut off, is said to have effected a cure; but the most frequent remedy is that of trepanning, a hazardous operation, which can only prove successful in the hands of skilful persons.

§ 4. The Flux

is a diarrhoea, or looseness, that attacks sheep which suddenly come to full feed, after having been stinted with
food; though it is sometimes by their eating the plant known by the names of may-weed, mathen, or fetid chamomile (Anthemis cohila of Linnaeus). In general, the flux is not attended with any dangerous consequences, and usually disappears in the course of a few days, in dry weather. Should it, however, continue longer than a week, it will be proper to give them some well-dried, sweet hay, and a decoction of clover flowers, with the addition of a little barley meal; allowing them neither any salt, nor to feed on any saline plants near the coast. But it is evidently the farmer's interest to give these useful animals a regular supply of food, as the weakness occasioned by the flux must necessarily reduce their condition.

§ 5. The Fly.

This disorder is chiefly confined to sheep that are continually exposed in hot seasons, particularly in inclosed woody districts. The insects from which the disease derives its name, live among the wool, where they materially prevent sheep from thriving, from the severity with which they bite. Hence various remedies have been suggested, most of which, however, are in some degree injurious to the wool. Flowers of sulphur, mixed up with butter, lard, or other unctuous substances, and rubbed in with the hand, have been found least hurtful to the quality of the wool; and the remedy, suggested by Sir Joseph Banks, for the scab in sheep, (which will be discussed in a subsequent page) may be applied in the present case. When, however, maggots are formed, they should be carefully scraped from the wound, to which turpentine and brandy, mixed together, may be applied. Mr. Marshall ("Rural Economy of the Midland Counties") directs such maggots to be picked out with a knife, or otherwise removed, without breaking the coat, when a quantity of white lead is to scraped among the wool, which being agitated, the powder
DISEASES OF SHEEP.

is carried evenly down to the sore. But due attention must be given, that too much ceruse be not applied, as it will discolour the wool; while a small quantity prevents any farther injury from the maggots remaining among it, as it drives them away from the wound, the healing of which it promotes at the same time.

§ 6. The Foot-halt,

as its name announces, is peculiar to the feet of sheep. It is occasioned by an insect resembling a worm, two, three, and sometimes four inches long. It is indicated by lameness, which often increases to such a degree as to prevent the animal from grazing. From pain and want of food the sheep languishes, till at length it falls a victim to the disorder, unless the worm be opportunely extracted.

As soon, therefore, as a sheep is observed to limp, the lame foot ought to be examined between the close of the claws, where the skin is found perforated, through which the worm has worked its passage upwards, between the external membranes and the bone. In order to extract the insect, it will be sufficient to move the claws in contrary directions, backwards and forwards, till the worm gradually makes its way to the surface. This simple expedient is far preferable to the operation of drawing out the insect, as in the last case there is always danger of its breaking off, and rotting in the leg of the sheep, the value of which will thus be materially injured. As the foot-halt occurs more frequently in wet than in dry seasons, and generally in the spring and fall, but rarely in summer and winter, it may be prevented, in most cases, by pasturing sheep in dry and healthy grounds, rather than in low meadows or marshy soils.
§ 7. The Foot-rot

is another disease peculiar to the feet of sheep, and if it be not quickly eradicated, it is supposed to be contagious. It arises, in general, from sheep feeding on long, rank grass in wet seasons; but inattention to cleanliness will also produce the foot-rot as well as the foot-halt.

This disease is known by lameness, which increases as the foot-rot becomes more inveterate, by the oozing of a disagreeably fetid matter from between the claws, and by the appearance of proud flesh in the more advanced state of the malady; at length, if it be not timely discovered, the foot becomes so completely mortified by the cancerous humour corroding every part of it, as to become incurable, in which case the skin is the only valuable part of the animal. It is remarkable throughout the progress of this disease, that sheep retain their appetite, and apparently feed as well as when in perfect health; though they very soon fall away; and continue declining till they have lost all their fat. Their appetite, however, remains till the very last stage; and instances have occurred, in which they have been so eager as even to crawl on their knees for food.

Various remedies have been tried and recommended for the cure of this contagious disorder, of which the following appear most deserving of notice. As soon as the disease is discovered, the sheep should be separated from the rest of the flock, and the part affected pared and cleansed, so as not to touch the quick, and at the same time to remove the gravel, if any should be there contained; after which either of the remedies subjoined may be applied.—1. Mix four ounces of the best honey, two ounces of pulverized burnt alum, and half a pound of powdered Armenian bole, in such a quantity of train or other fish oil as will make the various ingredients of the consistence of salve. The honey should be first dissolved gradually, and the bole carefully
DISEASES OF SHEEP.

stirred in, and then the alum and oil are to be added.—Or, 2.
Reduce three ounces of verdigris, four ounces of alum, a
similar quantity of vitriol, one ounce and a half of white
mercury, and one ounce of white copperas, respectively
into a fine powder, and gradually dissolve the whole in one
quart of white-wine vinegar. It may be proper to observe,
that the former remedy was invented by Mr. George Culley,
an eminent grazier, of Fenton, in the county of Northum-
berland; and the latter, by the late eminent Mr. Bakewell.
In Mr. Young's opinion, ("Annals of Agriculture," vol.
xxi.) the salve is more efficacious than the liquid, having
in one or two cases effected a cure where the latter had
failed; but Mr. Y. states, that he uniformly employs Mr.
Bakewell's remedy before the animals are anointed with
Mr. Culley's salve.—Or, 3. Two ounces of roch alum, a
similar quantity of blue vitriol, one ounce of verdigris, and
a quarter of an ounce of animated quicksilver may be dis-
solved in a quart of good distilled vinegar; and this liquid
may be dropped on the diseased part, care being taken to
keep the feet dry, and clean from all dirt or filth.

§ 8. Gall, or Seower.

This disease prevails chiefly during winter, and is sup-
posed to be produced by severe frosts. An immediate
change to dry food is the best remedy that can be resorted
to; and it appears from the practice of Mr. Ellman, that if
some hay be given to sheep on those mornings when hoar
frosts are upon the ground, it prevents them from being at-
tacked by the gall.

§ 9. Hoving, or Blown.

See ante, Sect. I. § 6. p. 177.
§ 10. The Hunger-rot

is generally occasioned by poor living, especially from a scanty supply of winter fodder. It may be easily known by the leanness of the sheep. An immediate change of keep is the proper cure.


In this disorder the wool, or hair, falls off spontaneously from the sheep. Scanty keep, exposure to much wet, or sometimes a sudden change from poor to full feeding, will variously produce the pelt-rot, which is likewise occasioned by the scab. In the last case, the removal of that disease will of course effect a cure; but in the former instances, as soon as a sheep is discovered to be affected (if not too far gone), it should be separated from the flock, and driven into a detached yard, where the diseased parts should be cleansed, and the animals anointed with a mixture of turpentine, lard, or other grease, and tar, in such proportion as to form a salve; and where they should be supplied with the best food, an attentive regard to the regular distribution of which, especially in winter, would effectually prevent this malady.

§ 12. Redwater.

This malady is sometimes called the resp, and is believed to originate from sheep feeding too freely on turnips, clover, or other rich and succulent vegetables. Frequent driving about and the use of common salt are said to be successful remedies in the redwater, which, it is asserted, may be prevented by giving the animals dry provender in the course of the night, after they have been feeding on the vegetables above mentioned. The use of parsley in this malady is likewise said to be beneficial.
DISEASES OF SHEEP.

§ 13. The Rickets.

This disorder occurs chiefly in the county of Huntingdon, where it is supposed to have been introduced from Holland. Few diseases are more fatal than the rickets, the causes of which have never been precisely ascertained, so that no remedy applied for its removal has hitherto been attended with success.

The symptoms indicating the existence of this malady are, first, a species of giddiness, which renders the sheep uncommonly wild and fierce; starting up suddenly, and running, on the approach of any person, to a considerable distance, as if it were chased by dogs. In the second stage; a violent inflammatory itching in the skin takes place; the sheep rubs itself violently against trees, hedges, &c. so as to pluck off the wool, and even to lacerate the flesh; no cutaneous eruption ensues, nor does any discharge of matter follow, and every thing indicates a most violent fever. In the last period of the rickets, the progress towards dissolution is very rapid, and the sheep, after reeling about, lying down, and occasionally taking a little food; at length expires.

This disorder is chiefly prevalent in the spring, and is hereditary; so that, after remaining concealed for one or two generations, it reappears with increased violence. The rickets also appear suddenly, in consequence of which circumstance no precaution of the most judicious grazier can detect the malady; hence there is no other alternative, but to cease breeding from such stock. We trust the attention of graziers and breeders will be more particularly directed to this formidable malady.

§ 14. The Rot.

Few disorders have been more fatal to sheep, or have more frequently exercised the attention of graziers and
breeders than the rot; the symptoms indicating which are, dullness of the eyes; the livid hue of the gums, foulness of the teeth, ill scent of the breath, and the ease with which the pelt or wool (and in the last period the horns) may be plucked out from their roots.

Various causes have been assigned for the origin of the rot. Thus ("Letters and Papers of the Bath and West of England Society," vol. i.) it is attributed to fluke-worms, that breed in the livers of sheep, whither they are conjectured to be conveyed through the nostrils while the animals are grazing; but these worms are evidently rather the effect than the cause of rot. The late Dr. Darwin suspected it to proceed from the inactivity of the absorbent vessels of the livers of sheep; so that their bile becomes too thin, particularly in wet or moist seasons. Dr. Harrison, in a recent interesting tract on the rot, is of opinion that it originates from miasmata paludum, or those unwholesome exhalations that arise from marshes; but to this suggestion salt marshes form a striking exception. And it is a fact, that in the county of Lincoln, in rotting seasons, the sheep fed on salt marshes, which are overflowed by the spring tides, sell at very high prices, from the confidence that they are safe. From an attentive consideration of every circumstance, it is evident, that superabundant moisture, either of food, atmosphere, or situation, is the real cause of this dropsical malady; though it is certain, that the dry limed land in Derbyshire will produce the rot as well as meadows that retain water and stagnant marshes; so, in driving sheep to any distance, if they be suffered to lie only one night on a wet spot of ground, whether in an elevated situation or not, they are very liable to the rot.

Equally various with the conjectures respecting the origin of this destructive disease are the remedies which have been recommended. The late eminent botanist, Miller, advised parsley to be employed as a preventive,
which is eaten with great avidity by sheep, (the delicacy of whose flesh it greatly improves), as instances have occurred where sheep, fed on parsley, remained sound, while those in the neighbourhood were affected with the rot. Mr. Mills, therefore, recommends sheep to be fed with that vegetable twice in the week, for two or three hours each time. In places where the rot is usual, it will be advisable uniformly to fold sheep (where that practice is retained) before the dew falls, and to confine them in such folds till it evaporates, both in the spring and summer; feeding them with sweet hay, or other dry provender. In the Bath papers already referred to, it is remarked, that no ewe is ever subject to rot while she has a lamb by her side; and it is there recommended, to place sheep that are affected with this distemper, so that they can get at the bark and young shoots of elder. Mr. Price (in the same practical work) advises every farmer to remove his sheep, in wet and warm seasons, from such lands as are liable to occasion the rot; but, if this object cannot be obtained, he directs a spoonful of common salt, and a like quantity of flour, to be given to each sheep in a pint of water, once or twice in the course of the week, by way of preventive. And, in case the disease be in an incipient state, he is of opinion, that the giving of such a dose for four or five mornings successively will probably effect a cure; for the addition of the flour and water not only abates the pungency of the salt, but also dispenses it to mix more gradually, and consequently more effectually, with the chyle. The late Dr. Darwin, however, conceived that salt would be more efficacious if it were combined with iron filings and flour, and made into a ball, to be given every morning successively for a week. Farther, as a preventive, it has been recommended by Mr. Varlo, an experienced agriculturist, to give each sheep a spoonful of common salt once a week, when a "rotting season" is apprehended; and, when the animals are accus.
tomed to it, he directs some dry salt to be laid on flat stones, in various parts of the pasture, as they will then lick it up without any farther trouble.

Beside these preventive remedies, various medicines have been recommended to the attention of farmers and breeders; though, we conceive, they can only be employed with probability of success in incipient cases. Of these remedies we select the following:—1. Put a handful of rue into a pailful of water in the evening, and on the following morning add such a quantity of salt as will make a brine strong enough to float an egg. Half a pint of this infusion is to be given, as a dose; every other day, for a week.—2. Infuse soot in in strong brine, and give each animal six or seven spoonsful for eight or ten successive days.—3. Ellis recommends a peck of malt, or more, to be mashed and brewed into twelve gallons of wort, in which a quantity of bloodwort, comfrey, pennyroyal, plantain, sage, shepherd's purse, and wormwood are to be boiled; the liquor to be worked with yeast, some common salt to be added, when it is to be put into a cask for use. Of this medicated beer seven or eight spoonsful are to be given to each sheep, once in the course of a week, during wet weather; but with longer intervals in dry seasons.

Among other remedies, we would here notice a patent, which was granted to a Mr. Thomas Fleet, in October 1794, for a medicine, which he affirms will not only prevent the rot in sheep, but also check the farther progress of the disorder in such as are already affected; so as to render them capable of being fattened on the same herbage which produced the disease. His restorative medicine consists of the following articles, the proportions of which, however, are not stated in the specification of his patent, viz. alkenet root, antimony, Armenian bole, bark, camphor, mercury, opium, salt, sulphur, turmeric, turpentine, and distille water; which multifarious ingredients are simply directed
to be prepared according to chemical, and compounded according to medical art. [Not having had experience of the effects of this nostrum, we cannot say how far it answers the properties claimed for it by its inventor; hence we shall only add, for the information of such of our readers as may be disposed to venture a trial of it, that the remedy in question is prepared by a Mr. Thomas, of Basingstoke, in the county of Hants; and that Messrs. Moore and Co. of Fleet Street, are the London agents for the sale of it.]

But, from whatever cause the rot may proceed, the chief thing on which the farmer can depend is, that of changing the situation of the sheep to a dry spot, or of keeping them in warm and well-sheltered yards, and regularly giving them sweet, dry-keep. If medicine be necessary, let a ball be given daily, for a fortnight, composed of five grains of muriated quicksilver, and one grain of opium, in camphor or turpentine; increasing the proportions, if the operation be deficient, and with slight intervals if the balls operate too powerfully. When the sheep begin to recover, salt should be constantly given them with dry food; and, when they are turned out, they should be driven to a dry, salubrious, and elevated sheep walk, or into a salt marsh, if there be one in the vicinity.

§ 15. The Rubbers, or Rubs,
is a species of itch, which renders sheep extremely restless, and in consequence of which they rub themselves to death, being completely, but gradually, exhausted, from not being able to feed. Their skins are perfectly clean; and, when dead, their flesh becomes of a greenish hue, without possessing any bad taste. Those animals which are fed on fine, rich soils are more liable to the rub than those which are pastured on poor lands; and the disease usually terminates in the course of three or four months. No effectual remedy has been hitherto discovered; though it is proba-
ble that relief might be obtained by washing the diseased sheep with strong soap-suds or ley, or by recurring to the remedies employed for the scab.

§ 16. Scab.

This disease is likewise known by the name of shab, or ray, and is attended with an intense itching, and cutaneous, scabby eruptions, occasioned by the impure state of the blood. It prevails chiefly in wet situations and during rainy seasons; and as the scab is said to be infectious, the diseased animals ought, in every case, to be separated from the rest of the flock.

The scabbed sheep should next be washed with a strong decoction of tobacco in brine (in the proportion of one pound to two gallons), to which a little oil of turpentine has been added; or, in inveterate cases, with a lather of black soap, lime water, or sublimate water, and oil of turpentine; sulphur and bay salt, or Glauber's salts, being administered internally. The following preparation has also been found effectual: mix one pound of tobacco, one ounce of white arsenic, one pint of oil of turpentine, and six quarts of beef brine, with a small quantity of tar, and boil the whole till the ingredients become incorporated so as to form a linement; in applying which every scab must be broken, and the sheep be well rubbed, that the liquid may penetrate every part. Another efficacious remedy was communicated by Sir Joseph Banks to the "Society for the Encouragement of Arts, Manufactures, and Commerce," in 1789, from whose Transactions for that year we have selected it.

Let one pound of pure quicksilver, Venice turpentine, and common oil, of each half a pound, and four pounds of hog's lard, be triturated in a mortar till the quicksilver is thoroughly incorporated with the various ingredients. In applying this ointment, the head of the sheep must be first
rubbed; after which a furrow is to be drawn with the finger, from the region between the ears, along the back to the point of the tail, so as to divide the wool, till the skin be exposed to the touch. Then the finger, being dipped into the unguent, must be drawn along the skin; and similar furrows should be made down the shoulders and thighs, as far as the wool extends; and if the sheep be much infected, two other lines, or furrows, ought to be drawn parallel to that on the back; and one should also be traced downwards on each side, between the fore and hind legs. After this application, it is stated, that the sheep may be turned out among the flock without fear of communicating infection, as the blotches will in a few days dry up, the intolerable itching will subside, and the animals will be perfectly cured without any injurious effects resulting from the use of such unction. But this external remedy should, in the opinion of Sir Joseph Banks, be not delayed longer than Michaelmas.

§ 17. The Tick

is a small, brownish, and flat insect, infesting sheep, and which, if not speedily destroyed, materially injures both the flesh and wool into which it insinuates itself. When the vermin have settled, scabs are formed on the surface, whence a small quantity of matter issues: as the insects increase in growth, the scab becomes proportionably larger, and at its full size nearly resembles a middling-sized horse-bean. In order to remove these noxious vermin (which spread very rapidly), it has been recommended to separate the wool, and to wash the diseased spots two or three times, or oftener, if necessary, with a liquid preparation, consisting of one ounce of cream of tartar and a quarter of a pound of bay salt (both finely powdered and sifted), and one ounce of corrosive sublimate, mixed together in two quarts of soft water. Or, four pounds of soft soap and two pounds of
arsenic may be steeped in thirty gallons of water, and the animals be immersed in the infusion, their heads being carefully kept above water, and the sheep being sheltered from rain for one or two days. The wool must be closely pressed, and the liquor that runs off be caught in a tub, or other vessel, for future use. Of this application it is sufficient to state, that it is approved of, and used by those eminent agriculturists, Lord Somerville and T. W. Coke, esq. of Holkham-Hall, in the county of Norfolk: the proportion above specified is sufficient to bathe forty lambs.

§ 18. Affections of the Udders of Ewes.

After the lambs are weaned, the lacteal ducts of ewes' udders are liable to various obstructions, in consequence of hard tumours being formed, which are accompanied with inflammation; and which, if not shortly relieved, will terminate in a mortification in twenty-four hours. As soon as such tumours are discovered, the wool must be shorn closely off, and the part affected be frequently rubbed with camphorated spirit of wine. Should suppuration ensue, the parts must be opened with a sharp knife or razor, and the morbid matter expressed, when a little fresh butter, or any common healing salve, may be applied to the wound. Ewes, when thus affected, ought to be kept separate from the flock; and, though one teat may probably be lost, yet she may be allowed to suckle her lamb; but, when both teats are affected, there is no alternative but to fatten her off for sale, and to bring up the lamb by hand.

§ 19. White Scour.

This disorder is a peculiarly violent and uncommon looseness, occasioned by sheep feeding on putrescent vegetables, especially the shells of turnips, when suffered to lie on the ground after the flesh or pulp has been scooped out. The diseased sheep must be separated from the flock, and
three large spoonsful of the following mixture be given them, every second or third day, as the nature of the case may require: mix half a pound of finely-powdered and sifted dry, bay salt with one pint of old verjuice, and then add half a pint of common gin. As poverty of keep is the primary cause of this malady, the animals must be allowed the best and most wholesome dry food.

§ 20. Wounds.

Besides the various casualties above specified, sheep are liable to receive injuries from being wounded by thorns, &c. or worried, torn, or bitten by mischievous dogs, or such as are not thoroughly broken in. Although such accidents may be in general prevented by due care and attention, yet in cases of common green wounds it may be necessary to apply some healing, or emollient balsam or salve. With this intention let one ounce of myrrh, a similar quantity of Socotrine aloes, and four ounces of purified turpentine be mixed with a quart of good brandy in a bottle. The vessel should be corked up, and exposed for one or two weeks to a moderate heat, after which it may be strained off, and preserved for future use in a closely-stopped bottle.

Lastly, the farmer or shepherd ought frequently, if not daily, to examine his flock, and see that their tails and buttocks be kept perfectly clean, otherwise they will become tagged, or belted, i.e. the skin will become excoriated and sore from the dung that adheres to those parts, especially when the animals are affected with the flux, or white scour. Where this is the case, the sheep must be taken into a dry, separate yard, and well washed with soap-suds, the wool around the sores being previously removed; after which the wounded parts may be strewed with finely-pulverized white-lead or chalk, and this may be succeeded by rubbing them with a mixture of brandy and tar.
SECTION V.

Diseases of Lambs.

It sometimes happens that lambs, when yeaned, are apparently lifeless, in which case it will be proper to blow into the mouth and nostrils, a simple expedient, which has been the means of restoring multitudes of these useful animals.

The black water is one of the most fatal maladies to which lambs are subject; the cause is not precisely ascertained, but the disease carries them off very suddenly, and occurs chiefly in the autumnal quarter. The best preventive hitherto known is, to keep them on very dry pastures.

The blood, or red-water, likewise often proves a mortal distemper to lambs. Its symptoms are, lameness and a slight swelling of the joints, accompanied with a violent inflammation that spreads over the whole animal; and which, if disregarded, terminates its existence in the course of twenty-four hours. This disorder is produced by too great a quantity of food remaining on the stomach, in a crude and undigested state. As soon, therefore, as the disease appears, the lambs must be taken home from grass, be bled, and an emollient clyster administered. Two or three ounces of castor oil, or as many grains of emetic tartar, should next be given, and the bleeding repeated, if no favourable symptoms appear; the treatment above specified being continued for four, five, or six days, as the case may require; and, during that term, the lamb should be fed with milk.

The skit is a kind of scour, or diarrhoea, and is sometimes divided into green and white, according to the appearance of the dung. Give a decoction of hartshorn-shavings and finely-scraped chalk, in which a few grains of opium have been dissolved, and keep them on dry, wholesome food, in a well-sheltered yard.
SECTION VI.

Diseases incident to Swine.

In the management of swine, various hints have already been given for the regular supplying them with food, and a due regard to cleanliness; these attentions cannot be too forcibly impressed, as, on account of the unruly habits of these animals, they are the worst patients with which a farmer can be tormented.

§ 1. Gargut.

This is an inflammatory affection of the udder, or bag, being distended with coagulated milk, whence the lacteal ducts are obstructed. It is chiefly occasioned by not sucking down in proper time; though too rich keep, before the time of farrowing, will also produce this malady. In slight cases, the udders may be bathed with camphorated spirit of wine; but as young pigs will never suck their dams when the milk becomes vitiated, there is no alternative but to gently express the corrupted milk, if it can be effected; otherwise it will be best to kill the sow, which must necessarily perish from the inattention above noticed.

§ 2. Fever,
or rising of the lights, as it is likewise called, appears to originate from over feeding; it may be removed by administering a mixture of sulphur and oil.

§ 3. Diseases of the Lungs.

These are generally accompanied with a dry, husky cough, and wasting of the flesh, occasioned by too great exposure to cold and wet. The best remedy is a warm, dry
stie, with a regular supply of food that is calculated to keep them cool, and allay the irritation attendant on their cough.

§ 4. The Mange,

like the scab in sheep, is a cutaneous eruption, occasioned by inattention to cleanliness in hog-sties. It is easily known by the violent rubbing of swine against trees, or any hard substance, with such violence as to tear away the head of the pustule, and to produce a disagreeable scab. When this disease appears, the animal affected must be separated from the rest of the herd, washed thoroughly with a strong soap-ley, and anointed with the following unguent, recommended by Dr. Norford ("Annals of Ag." vol. xv.). Incorporate one ounce of fine flour of sulphur, two drachms of fresh-pulverized white hellebore, three ounces of hog's lard, and half an ounce of the water of kali (as prepared in the shops), so as to form an ointment. This is to be rubbed in at one time, and is said to be sufficient for a beast of six or seven stone: if properly applied, Dr. N. states that no repetition will be necessary, if the hog be kept perfectly clean after the cure is performed. In case there is a slight cough, he directs from half an ounce to one ounce and a half of crude antimony, according to the size of each animal, to be finely pulverized and mixed with his daily food, for ten days or a fortnight, when the swine will be perfectly restored. But if, from long neglect, the necks, ears, (especially in the large, lop-eared hogs,) or other parts become ulcerated, they should be anointed every third or fourth day with a little tar ointment, prepared by mixing equal parts of mutton suet and tar over a gentle fire, and straining such mixture while hot.

§ 5. Measles.

This disorder exists chiefly in the throat, which is internally filled with small pustules, or tumours, that some
DISEASES OF SWINE.

§ 6. *The Murrain,*

or *leprosy,* in swine, is indicated by shortness and heat of breath, heads hanging down, staggering, and a secretion of viscid matter from the eyes.—*Causes:* chiefly hot seasons, in consequence of which the blood becomes inflamed.—*Remedy:* boil a handful of nettles in a gallon of small beer, then add half a pound of flour of sulphur, a quarter of a pound of pulverized aniseeds, three ounces of liquorice, and a quarter of a pound of elecampane. Give this liquid in milk, at six doses; and keep the diseased animals on wholesome food. But the best preventive is to keep swine clean and cool in summer, and to allow no carrion, or filth, whatever to remain near their sties.
No department of practical mechanics has, perhaps, been more assiduously cultivated, of late years, than that which has for its object those implements, which are used in the various branches of husbandry, (including in that term, the whole of rural and domestic economy); such as churns, wheel-carriages, ploughs, hoes, &c.; the most important of which will be noticed in the following pages. But, notwithstanding the attention that has been thus bestowed, in the construction of more perfect machinery, calculated to facilitate the various operations, and consequently, the improvement of husbandry, especially by the premiums and donations given by the numerous British patriotic Agricultural Societies; much still remains to be done in this important branch of economy, particularly with regard to simplicity of construction, and facility in using the respective implements; and, we trust, the period is not far distant, when these desirable objects will be completely attained, since the most respectable individuals of this highly-favoured island have not disdained to devote their attention to this subject.

SECTION I.

Wheel-carriages.

The wheel-carriages, most commonly used for the various purposes of rural economy, are waggons; the structure of
Ox Yokes.

Fig. 1.

Fig. 2.

Carts

Fig. 3.

Front View of Lord Somerville's Drag Cart.

Fig. 4.

Side View of the same Implement.
WHEEL-CARRIAGES.

which, is of different forms and dimensions in various countries: but they are, in general, too unwieldy to be employed with effect and convenience, though sanctioned by long use and custom. The waggons of Norfolk are of a middle size and height; where, on a farm of a moderate size, three or four are mostly kept: in that district, however, the farmers avail themselves, during harvest, of the advantages afforded by waggons, without the inconvenience resulting from its weight. With a common dung-cart and a pair of old waggon shafts and fore-wheels, a carriage is formed; which, as it partakes both of a waggon and a cart, is called a maphrodite, or more properly, a hermaphrodite, (Marshall’s “Rural Economy of Norfolk,” vol. 1.) In this vehicle, the points of the shafts rest on the bolster of the fore-wheel, to which they are fastened. A copse, or fore-ladder, similar to that which is sometimes fixed upon cart shafts, but longer, is also supported by the bolster, projecting over the horse in front, in the manner of the fore-ladder of a waggon; so that the length and breadth of the hermaphrodite vary very little from those of a waggon. In hilly districts, “where carts are in a manner useless in harvest,” Mr. M. conceives that the cart-waggons would be found very convenient.

In his opinion, however, ("Rural Economy of Gloucestershire," vol. 1.) the Gloucestershire waggons are preferable to any others; but they are not so high as those of Norfolk; for, the former having a crooked side-rail bending in a kind of arch over the side wheel, their frames or bodies (in some parts of England, denominated the buck) are kept low, while the diameter of the wheels is not materially lessened. The bodies are also made wider, according to their shallowness, and the wheels run six inches wider than those of the generality of waggons; in consequence of which, it is obvious, that very great advantages are obtained in carrying top-loads.
Farther: there is a peculiarly useful waggon employed in the county of Berks, for the purpose of carrying turf, grain, and other articles. These carriages are greatly superior to the generality of the vehicles occurring in the more western and southern districts, from the neatness of their structure, as well as the facility with which they may be drawn; while they have sufficient strength, without the unwieldiness and height of the other waggons. But with all their excellence, as they are now made, the Berkshire waggons are subject to one great inconvenience, by which a considerable portion of time is lost, in turning at the end of swaths, carrying hay, as well in carrying corn, and many other articles: This disadvantage, however, may be obviated, without detriment either to the strength or proportion of the waggon, by adopting the valuable suggestion recently given in the “Agricultural Survey” of that county, viz. by leaving a space of sufficient depth in the bed of the waggon to admit the fore-wheels to lock round in the shortest curve.

It would far exceed the limits of the present work to notice the waggons of every district, or county, especially as the indifferent principles on which they are constructed, incontestibly prove that there are few implements of husbandry that are of more importance, or perhaps capable of more essential improvement than wheel-carriages. Nor can we but be surprised at the predilection, or infatuation, which has so long prevailed in favour of large teams and waggons, in regard to which Dr. Anderson has appropriately remarked, (“Recreations in Agriculture, &c.”, vol. iv.), that the great object of emulation seems to be, to try how an immense load of goods may be transported in one carriage, and at one time, without respect to any other circumstance. Such a procedure is in direct opposition to the best and most established principles of
mechanics, economy, and of common sense, as we hope to prove by the subjoined remarks.

Where such large machines are constructed, the various parts must be made so proportionably thick, that the very weight of the implement itself is a load, which not only subjects the owner to a great and needless expense in the cost, but also compels him to incur a great expense for horses, or other cattle, to drag that unnecessary load from place to place, while the latter might be more beneficially employed in tillage. And, when four, five, or any larger number of horses are yoked to a team, three of them must draw in a horizontal direction, and consequently in a manner totally inconsistent with their mechanism. Farther: the very large wheels of wagons materially increase the draught of horses, because the slow motion of those carriages obliges the horses to overcome their vis inertia every moment they are drawing them; that is, it is the same thing as putting it into a state of motion from a state of rest every moment; for no one is ignorant of the small force that is capable of keeping a heavy body in motion.

These remarks are as applicable to stage or road wagons as to those which are used for the purposes of husbandry; though it has been suggested, that, in performing distant journeys through level and substantial roads, where road wagons are constantly and fully laden, one of them may be employed with as much benefit as two or more vehicles of smaller dimensions. Where, however, dispatch and celerity are required, as in housing hay, &c., it is obvious, that such ponderous machines are unfit for the purpose. A good horse, it may be observed, can draw upwards of a ton, or 2000 weight; in drawing which a great portion of the animal's strength is exhausted in pulling the wagon, rather than the load it contains, to which his strength ought to be applied. Hence several judicious farmers have availed themselves of lighter carriages, for conveying different Q
articles to and from land, so as in a great measure (and in Ireland, and in a few other places entirely,) to supersede the use of waggons. For this purpose the *improved Irish car*, of which the subjoined figure will convey an outline,

![Diagram of an improved Irish car](image)

is superior to any other vehicle that can be employed. Nothing, indeed, Mr. Young remarks, can surpass the amazing speed, with which corn and hay fields are cleared in Ireland, by means of this useful but inelegant carriage. With regard to form, the Irish car is almost square, the bed being only a few inches longer than it is in breadth; and the wheels, which should be at least six inches broad, are made low and broad, have a flat bearing, and are placed beneath the cart.

The benefits to be derived from this machine, which was preferred to any other by the late eminent farmer and breeder, Bakewell, (by whom an interesting account of it is given in the "Communications to the Board of Agriculture," ) are as follow: on account of its lowness it may be easily filled; when narrow or confined gateways and roads occur, much room is gained by the wheels being placed below the body of the car; and it may be drawn with great facility on soft meadow or ploughed lands, with less injury to the latter than is practicable with any other cart. An-
other advantage is, that the rims of the wheels being cylindrical, the draught is much inclined; consequently there is more facility and less resistance, and heavier weights can be drawn. The superiority of wheels with cylindrical rims over those with conical rims, has been clearly demonstrated by Alexander Cummings, esq. (in "Communications to the Board of Agriculture," vol. ii.); and though the nature of the present work forbids an analysis of his long and important paper, yet we trust the annexed brief statement of the inferiority of conical rims over cylindrical ones will not be useless, especially as our remarks are equally applicable to the wheels of any other carriage. In the first place, then, conical rims require a uniform or constant force to keep them in a direct line, which force produces an increased friction on the rim; besides, they augment the friction on the axis, and, in dry seasons, reduce the best materials to powder. In wet weather, or when the roads are soft, they break and injure the texture of the ground, render the draught more difficult, and greatly contribute to the wearing of the tires. On the contrary, the cylindrical rims are altogether free from these detrimental properties: they have a constant tendency to proceed in a straight direction, are subject to little or no friction or rubbing at the circumference, or against the sides of deep ruts; nor do they throw up any dirt by the hind part of the wheel, increase friction on the axis, press against the lench-pin, and tend to displace or break the texture, or retard the consolidation of the parts on which they revolve. Farther: wheels with conical rims, by frequently rolling on compressible substances, render these more level, and impermeable to water; and, by conducing to keep dry the internal and softer parts of roads, they are better enabled to resist injury and support the crust which protects them. Lastly, instead of opening the joints on paved roads, these become improved by the cylindrical rimmed wheels operating as a
rammer on the stones over which they pass, from the dead pressure produced by the uniform and equal velocity of every part; and, as they advance in a straight line with the least possible resistance, they serve alike to improve the roads, relieve the cattle, and preserve the tires.

But with all the advantages which the improved Irish cars above described possess, (and they are confessedly very great), there are some eminent agriculturists, who, after careful consideration and comparison of their merits, conceive single-horse carts to be preferable to the Irish cars. This difference of opinion is not for us to reconcile: it is however certain, that as horses have more power in drawing singly than in a team, these carts are superior to large carriages, by the increased proportion of labour which those animals can perform. And ("Annals of Agriculture," vol. xviii.) Mr. Young has given the annexed dimensions of a one-horse cart, which he has, after long experience, found to be the most advantageous, viz. the buok, or body, is five feet one inch long, three feet seven inches broad, and two feet deep; the cubical feet amounting to thirty-five and a fraction. On a farm, then, comprising three hundred and fifty acres, Mr. Y. states, that he employed only five of these carts, and remarks, that he would not increase that number more than one, though he were to occupy four or five hundred acres. It is worthy of notice, that no farm of equal extent, in an arable district, has less than three waggons, three tumbrels, and a light cart, the expence of which, in 1792, (the time when Mr. Y. wrote his memoir), amounted to 109l. while the building of six carts, according to his plan, cost only 63l. (now they would cost about 72l.) so that upwards of forty per cent. are annually saved in the article of repairs.
The figure above delineated, represents an excellent one-horse cart, invented by Lord Robert Seymour, who employs it on his estates, with the most complete success. In a valuable communication, inserted in the "Annals of Agriculture," (vol. 27,) Lord S. remarks, from actual observation, that one horse, acting by himself, will perform half as much more work as he can do, when coupled with another; so that two horses, separately, can do the work of three conjunctively. This difference is occasioned, partly by the single horse being so near the load he pulls, and partly from the line of draught being so much below his breast; the wheels of one-horse carts being mostly very low. Besides, when two horses draw together, one of them is usually inconvenienced by some difference of rate; the horse before or behind him being slower or quicker than himself. On the contrary, a single horse has only his load to encounter, and suffers no inconvenience from the disproportionate height of his companion; nor is it necessary to employ any additional drivers; as, when once accustomed to go singly, horses will follow each other with as much uniformity and steadiness, as when they are harnessed together; so that, on the most public roads in Ireland, one man guides three, four, or five one-horse carts, without any inconvenience whatever to passengers.

The following are the dimensions of Lord Robert Seymour's single-horse cart.—Body: across the bottom, two feet eleven inches; inside length, three feet nine inches;
height, one foot; sloping top, nine inches.—*Iron wheels*: height, two feet eight inches; rim, three inches and a half in width; spoke, three inches and a quarter at each end, decreasing to two inches at its centre. With a view to furnish a regular supply of grease his lordship has introduced four cavities or grooves into the boxes, which increase a little towards their centres; and, in order to defend the wrought iron axle-tree against the harder end, or extremity of the box, he ordered it to be steeled.

In the commencement of his communication, Lord Seymour remarked, that the price of iron, cast into wheels, was, at that time (1756), sixteen shillings per cwt. and each wheel weighs about three quarters of a cwt. But there are two objections to the use of low cast iron wheels, viz. 1. That such iron is very apt to break on concussion: 2. that the course of a wheel, of so small a diameter, produces a very quick consumption of grease. The first of these inconveniences is effectually obviated, by the ease with which the rims of such wheels may be repaired, by means of wrought iron; which, when rivetted to the cast iron, gives to the wheel a degree of elasticity, and thus renders it, perhaps, stronger than when it was recently made. The latter inconvenience is removed, by the contrivance above mentioned, for the regular supply of grease.

In plate II. fig. 3. and 4. are represented a front and side view of a *drag-cart*, invented by Lord Somerville; selected from vol. 2. of "Communications to the Board of Agriculture."—Fig. 3. is a cart calculated for draught, by a single horse in shafts: *b b*. is a *friction-bar* or drag, that is fixed behind by a chain, and before by a toothed rack, delineated at *b d*. which catches on a staple, and by means of which the pressure may be regulated by the driver, according to the steepness of the decent: *c* is a toothed rack, fixed in the front of the cart, for regulating the position or centre of gravity of the load. In this figure, the friction-
drag is placed lower on the wheel than Lord S. originally intended, in order to divide the pressure and friction more equally on the opposite side of the wheel; thus the action on each is diminished, and the risk of over-heating and destroying the friction-bar is rendered less than if the whole pressure were applied in one point at the top of the wheel.

Fig. 5. represents a side view of Lord Somerville's drag-cart, designed to be drawn by two strong oxen, with a pole, yoke, and bows, the friction-bar being removed. In this figure, a more simple mode is adopted for regulating the position or centre of gravity of the load, as described at a b by the curved iron, perforated with holes for receiving a pin, to keep it at any required height; c is a small chain, to prevent the cart from going too far back in fixing it; and the letters d d denote the upper part of the cart, which is intended to contain bulky or heavy loads.

The following are the advantages to be derived from the adoption of the drag here described, and which is certainly preferable to any other similar contrivance.—1. The degree of friction and pressure may be expeditiously adjusted to the steepness of the declivity; so that the cart will neither press forward, nor require much exertion in the draught.—2. The friction is judiciously applied to the wheel, in such a direction, that a given pressure will produce twice the effect in retarding the progress which it would do, if it had been immediately applied to the body of the cart, or to the axis.—3. This apparatus is capable of being arranged with such facility, that it may be instantaneously adjusted, without stopping the cart, or exposing the driver to danger.—And, 4. It may be remarked, that still greater benefit may be derived from Lord Somerville's valuable invention, by applying it to both the hinder wheels of wagons: thus the resistance may not only be proportioned to the steepness of the declivity, so as to prevent, most effectually, the damage done to the high roads, and the unne-
cessary labour of cattle, when drawing locked carriages down hills; but also (which is of the utmost importance) it will remove the danger of the frequent accidents to which drivers are exposed; and will in future save that time, which is now of necessity lost, in locking and unlocking waggon-wheels.

Before the subject of carts be dismissed, it may not be amiss to notice one or two carriages of this description, which have been used with advantage in various situations.

The first is the Cornish wain; which is, perhaps, the simplest of all wheel carriages, and is adapted for draught either by horses or by oxen. It is a cart without a body, or more correctly, without sides; except only two strong bows or arches, that bend over the wheels, to prevent the load from pressing upon them, with a wince behind: from its lowness, it is easily loaded; and is admirably calculated for carrying home harvest crops; to which purpose it is chiefly applied in that county. In order to prevent the wheels of carts or other carriages, when heavily laden, from making deep ruts in roads, a useful expedient has been suggested by R. Beatson, esq. It consists simply in fixing between the other wheels, a protector (thus he denominates it) or small roller, or other broad wheel; of which, the circumference of the upper part should be almost one inch and a half below the axle-tree, while the lower one ought to be about that distance from the surface of the ground. This roller is to be secured to the axle-tree, so that it shall be capable of supporting the whole weight of the vehicle, in case the wheels should sink into any deep ruts. The size of the protector varies according to that of the wheels; but Mr. Beatson states, ("Repertory of Arts," &c. vol. viii. old series,) that a diameter of two feet will be sufficient for single carts; but that waggons or double carriages will require it to be both larger and broader. By thus raising the roller or protector a small distance above the lower
surface of the wheels, the latter will, on good roads, sustain the weight of the load; and, if the middle way, or horse-path be firm, they can neither sink into old, nor form any new, ruts; as the roller will move in the middle, and consequently afford a more easy draught to the cattle. If due regard be paid to the construction of the protector, its additional weight will be inconsiderable; especially when we consider its utility, and the great reduction it may effect, both in the repairing, and in the making of roads.

Lastly, a useful rolling-cart has been employed for carrying manure on low lands, during wet seasons*. It consists of three circular pieces of strong elm, two feet in diameter, and each eighteen inches in length, through which passes a strong iron axis, so as to project a few inches on each end beyond the rollers; allowing one inch between each piece, for the convenience of turning round. On the projecting part of the axis is placed a fixed frame, for supporting the body of the cart; which may, according to the nature of the soil, be loaded to any degree, or employed for carrying manure, or merely as a roller, on land whereon common wheels cannot be admitted to pass. By means of such rolling carts, the surface of the soil may be frequently compressed, in order that it may be more perfectly consolidated, so that the earthy particles may embrace the roots of the grasses, and retain their proper moisture, on which the luxuriance of such soils in a great measure depends.

SECTION II.

Chaff-cutters.

Various machines, under the names of chaff and straw-cutters, have of late years been contrived, for reducing hay

and straw into chaff, and diminishing manual labour; the economy and advantage of which practice have been already adverted to. Most of these are sufficiently calculated for this purpose; but, as it would exceed the limits of the present work, to enter into a detail of the comparative merits of these implements, we shall, at present, confine our attention to two of the most recent; and which, from their construction and other valuable properties, appear more particularly worthy of notice.

The first of these is Mr. Salmon’s chaff-cutter, of which an engraving is given in plate III. fig. 1. (from the “Transactions of the Society of Arts,” &c. for 1797.) The letters A A represent two knives, fixed on the inside of the fellies of two wheels B B, which are firmly connected; and the edges of which knives are at an angle of forty-five degrees from the plane of the wheel’s motion. And these knives are so arranged, that they are acted upon by the springs C C, which are so adjusted as to give them the degrees of pressure, against the box, requisite to cut the straw; with a view to prevent them from coming too forward, and thus producing an unnecessary friction, wedges are placed beneath the staples a a, which must be drawn out as the knives wear, so as to facilitate their progress; by which expedient new knives may be substituted for old ones as occasion may require, as they will always be regulated by the springs. D is a round block of wood, fixed to one side of the wheel, having four holes and a moveable screw: to this block is fastened, by means of screws, one end of the feeding arm E, that runs in nearly a horizontal direction to the cross-bar F, at the end of the box G. This end is attached to the cross-bar by the pin b, which may be shifted to five different holes in F; so that, by means of these, and of the four holes in the block D, twenty changes may be obtained in the length of the chaff.
M. Salmon's Improved Straw-Cutter.

M. M. Dougall's Chaff-Cutter.
Published as the Act directs. July 23rd 1805, by R. Cruickshank & Co. Stationers' Court.
The straw or hay is brought forward by two rollers in the box G, which are separately delineated at fig. 2. of plate III.; and which are turned from the cut side, by the ratch-wheels H, (one being on each side of the box) and move more or less quickly, according as the stroke is given to the cross-bar by the feeding-arm and wheel. Thus, while the knife is cutting, the straw remains at rest; and, on removing the cross-bar F, the supply immediately ceases, although the motion of the knives may continue. Is a pressing weight, suspended below the box, which may be more or less powerful, by shifting it on the bearer K, whence it hangs; this weight may also be inclined to either side, according to circumstances, and will contribute to force the straw towards the knife, while it counterbalances the ratch-wheel of the upper roller. Near the fulcrum of this bearer there is a fixed chain, represented by the dotted line Ee; the upper end of which is connected with a roller, having at each end a small iron bar, that is attached to the end of the upper spiked roller: thus the straw is uniformly pressed between the two cylinders. S is a winch, that serves to turn the machine. The letters MMMM denote the frame of the machine. Fig. 2. delineates the two rollers, already noticed in the description of the box G.

In order to make use of this chaff-cutter to the best advantage, Mr. Salmon, the inventor, proposes to place a second box at the end of the first: such second box may be made of any length, and suspended by a line and counter-weight; by means of which its end is brought down to a level, while it is filling with straw, and then drawn up, so as to give the second box a declivity; a contrivance by which the straw is brought more expeditiously forward. The advantages resulting from this additional improvement are, 1. The ease with which straw may be cut; and, 2. A very considerable saving in point of time; as it will not, in
this case, be necessary to stop at intervals, in order to feed the machine. The price of Mr. Salmon's chaff-cutter, we understand, is about twelve guineas.

In plate III. fig. 3. is given an engraving of a patent chaff-cutter, invented by Mr. Macdougal, of Oxford-street, by whom we have been favoured with an original drawing of it, for the use of this work. It possesses in a superior degree, facility in working, so that much time is saved in labour. The hay, straw, &c. intended to be cut into chaff, may be pressed as hard as the labourer pleases, by merely placing a weight nearer to the end of the lever. It should be observed, that, in the common chaff-cutters, an endless screw is usually inserted; for this Mr. M. has, with great judgment, substituted a spiral groove, by which excellent contrivance he has, in a great degree, removed friction, so that the lever may rise to any height, without deranging the order of the machinery. Should this straw-cutter, however, be broken or injured, through any accident, or the carelessness of servants, Mr. Macdougal has been especially attentive so to construct his implement, that it may, in such case, be easily repaired by any common mechanic; an important advantage this, in which constitutes one of its chief excellences, and in which the generality of chaff-cutters are miserably deficient.

SECTION III.

Ploughs.

Ploughs are, perhaps, the most important implements used on a farm; and, as the soils of farms are necessarily of various natures, so are ploughs diversified in their construction, and the purposes to which they are applied. In the present section, it is intended to notice only the principal
of those which have been invented, and which are, of course, most deserving of attention.

The ploughs in most frequent use, are those denominated swing-ploughs, which are not provided with wheels; consequently they are not liable to be clogged with dirt or mould; and, being effective implements, they are peculiarly calculated for strong lands, when judiciously guided, as the mould-board is so curved as to make less resistance in turning up the earth; and, of course, requires a smaller force to draw the implements. Of this description are, 1. The Rotherham plough, the structure of which is too well known to render any description of its various parts necessary: its simplicity and facility of draught have recommended it preferably to the cumbersome and heavy ploughs formerly used in various parts of this island.—2. Small's patent, or chain plough, which is an improvement on the Rotherham plough, the latter being reduced in size, and otherwise altered for the better. The most material variation from that in common use, is in the bridle, which is at the end of the beam of the chain plough; and which enables the ploughman to give the implement a more effective operation: and also, by means of some holes that are made in the beam, to cut the soil of greater or less depth, as necessity or occasion may require. The wood-work is composed of ash or elm, which renders it peculiarly light and convenient; and though this, as well as the Rotherham plough, (and also a swing-plough, which has been recently patronized and recommended to notice by the Board of Agriculture) are admirably calculated for turning up light soils, yet they are peculiarly adapted for strong, tenacious soils, where the progress of the plough is often impeded by stones. These remarks are equally applicable to the Suffolk iron swing-plough; a most effective implement, when judiciously guided, for breaking up heavy and strong lands.

Where, however, the soil is light, thin, and friable, any
of the common ploughs may be employed; though these ought to be as light as possible: and, as many obstacles are thrown in the way of ingenious men, who have endeavoured to introduce improvements in agriculture, by the local prejudices of farmers, and especially of labourers; we would suggest it as a remark, that is applicable to every description of ploughs, that great success, and much benefit may be obtained, by adopting the general construction of the fashionable plough of the country, only altering the proportions, and giving the operative parts the requisite cast.

But, with all the advantages which common ploughs possess from the improvements they have received, it not unfrequently happens, that they are choked by an accumulation of stubble, &c. in the narrow angle under the beam, before the coulter, and are thrown out of the ground, by catching small stones between the coulter and the sock. In order to obviate both these inconveniences, Mr. Campbell, an ingenious and practical agriculturist in Kintyre, in the county of Argyle, has altogether thrown aside the coulter, and supplied its place by an upright feather, attached to the land side of the sock, which serves the purpose of slicing off the furrow, in the same manner as a coulter: and, being laid off on the same angle, it has been used with uncommon success.

* Robertson, in Farm. Mag. vol. iii.
PLOUGHS.

The implement whence this sketch was taken, was on a small construction, and had been chiefly employed in horse-hoeing turnips, beans, cabbages, and other root-crops. The weight of the Argyleshire plough is about seventy-six pounds, its cost is about fifty shillings; and is manufactured very accurately by Messrs. Brown and Co. of Edinburgh. This implement is, from its lightness and facility of draught, of great general utility, and is peculiarly adapted for taking earth away from the sides of a drilled crop; as its broad upright feather completely shields the plants from all risk of earth falling on them, from the left side of the plough; while, at the same time, the ploughman can ascertain to a certainty, that the part of the implement (which is beneath the surface of the ground) approaches no nearer to the roots of the plants than the upper part does to their leaves; so that, if it be necessary, he can bring the plough to slice off the earth close in upon their sides. In point of draught it is precisely the same as the common plough.

Of wheel-ploughs there is a great variety, adapted to every modification of soil: and though these are less calculated for the expert than for the inexperienced ploughman, yet (notwithstanding the obstacles presented by their weight and increased difficulty of draught) they deserve to be introduced on stiff and tenacious soils, and, in short, wherever that can be advantageously effected; as they are not easily thrown out of the ground, and at the same time compensate for the additional expense of their cost, by their great expedition in work.

One of the most useful implements of this description, for light soils, is the Norfolk wheel-plough, so denominated from the county where it was invented; the soil of which, being loamy, light, and friable, does not render deep ploughing necessary. It is a light and compact instrument, and possesses great facility of draught: the price of such a
plough, we understand, is about four guineas. For light soils also, it has been recently intimated, that the Rotherham, or common swing-plough, may be effectually employed, by simply attaching one or two wheels near to the end of the beam; the requisite variations being made with very little loss of time, or trouble. Nor, where two wheels are made use of, is any holder necessary on lands that are in a good state of tillage, or on a light sward, except at turning out and setting in.

Another valuable wheel-plough is that known by the name of the Beverstone plough; which, if not invented, was at least very materially improved by Mr. Tugwell, of Beverstone, Gloucestershire.

![Diagram of a plough](image)

This excellent implement is remarkable for the simplicity of its structure, and its effective operation: it may be drawn with ease by two oxen, without a driver.—The following are its dimensions:

<table>
<thead>
<tr>
<th>Feet</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 1 to 3</td>
<td>6 0</td>
</tr>
<tr>
<td>3 - 4</td>
<td>3 8</td>
</tr>
<tr>
<td>3 - 5</td>
<td>4 3</td>
</tr>
<tr>
<td>5 - 6</td>
<td>2 5</td>
</tr>
<tr>
<td>7 - 6</td>
<td>2 8</td>
</tr>
<tr>
<td>1 - 3 [52]</td>
<td>1 5</td>
</tr>
<tr>
<td>1 - 8</td>
<td>2 10</td>
</tr>
</tbody>
</table>
### PLOUGHS.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Feet</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 1 to 0</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>From the heel to the tuck hole of the share</td>
<td>2</td>
<td>6½</td>
</tr>
<tr>
<td>From the tuck hole to the point of the share</td>
<td>0</td>
<td>8½</td>
</tr>
<tr>
<td>From A to B</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>A—C</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>C—D</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>D—E</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Diameter of the wheel</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>From D to F</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>G—H</td>
<td>0</td>
<td>10½</td>
</tr>
<tr>
<td>E—I</td>
<td>1</td>
<td>3½</td>
</tr>
<tr>
<td>K—L</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Breadth at the heel</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Breadth of the fin</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Top of beam at the heel to the ground</td>
<td>0</td>
<td>8½</td>
</tr>
<tr>
<td>The mould board projects at the top more than the</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>breadth at the heel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For breaking up fresh grounds, the improved common, single, and double wheel-plough may be employed with effect. The latter is used in some of the midland counties, being drawn by five horses, and attended by one man, in tolerably level soils, which it divides as well as two single ploughs. It is likewise employed, as also is the common single-wheel plough, in Staffordshire, where the latter has recently received an important improvement, by the addition of a flay, or iron earth-board, which is firmly screwed to the coulter. The advantage of it is, that in breaking up turf, the sward is cut off, and turned into the furrow, when it is immediately covered with earth. Thus, by the assistance of one additional horse in the team, the soil will, at one ploughing, in appearance resemble a fallow, and may be harrowed with nearly equal facility.

On stiff and tenacious soils, no implement is, perhaps, better adapted than the Herefordshire wheel-plough, the share of which is piked; in case, however, of very strong
THE COMPLETE GRAZIER.

land, the Kentish *turn-wrest plough* is an instrument of great strength, especially where deep ploughing is requisite, on dry, rocky, and hilly situations; as it turns the soil to a considerable depth, and lays the furrow slice perfectly level, without making any opening in the seam. This implement consists of an oaken beam, ten feet long, five inches deep and four inches broad: to the end of the beam is tenoned a foot; (five inches thick by three inches and a half in breadth, and three feet and a half long,) which is mortised at the bottom, to the end of the chep. Through the beam, at the distance of two feet five inches from the foot, there passes a sheath of oak, seven inches in width, by one and a half thick, which is mortised into the chep, in an oblique direction; so that the point of the share is twenty-two inches distant from the beam. The chep, to which the share is fastened, is five feet long, four inches wide, and five inches in depth; the share is composed of hammered iron, weighs about thirty-two pounds, is twenty inches in length, and from four and a half to seven inches wide at the point. The upper end of the beam (on the top of which are fixed the handles) rests on a carriage with two wheels, that are three feet two inches high: on the axle-tree is a gallows, whereon is a sliding bolster, to let up and down. Through the centre of the axle is a clasp-iron, to which is fixed a strong chain, called a tow, that comes over the beam, fixed in such a manner, as, by means of notches, (or a pin, denominated a *check*) to let the plough out to a greater length, and consequently it will penetrate the earth to a greater depth. The price of a complete Kentish turn-wrest plough (for the description of which, we are indebted to the able agriculturist Mr. Boys, of Belshanger, in that county) is five guineas.

Another admirable implement for breaking up stiff, deep, and tenacious lands, is the *double, or two-furrow, swing, and wheel-plough*: which was, we believe, invent-
PLOUGHs.

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Ed by the late eminent Mr. Duckett, but has received very material improvements and additions from the hand of Lord Somerville, especially in the mould-board. It would, however, lead us into too wide a field of discussion to detail the various parts of this machine without the aid of several engravings; and, unlike the preceding plough, as it is too complex to be manufactured from a simple description, we shall at present state, that the implement in question is capable of being effectively employed in various situations, though hitherto it has not been tried to that extent, or with that attention which the assiduous regard of its noble improver justly merits. As its name implies, the two-furrow plough produces two furrows at once, and appears to be best calculated for light and level soils, particularly for stirring ley-grounds; and, as these cannot be laid too flat, or seed-earths be laid too much on an edge, the tool may, by means of the improved mould-board, be easily adapted to either purpose. The chief advantages, however, resulting from the use of the two-furrow wheelpoughs, are the saving of attendance, (that of one person being altogether dispensed with), and the quantity of work they can do in a given time, which is nearly double that performed by common ploughs, with but little addition to the team; though, in strong and stony soils, great power of draught is necessary.

The paring-plough is a well-known instrument of indispensable utility, where the practice of paring and burning land is resorted to, as in the conversion of waste lands into a state of tillage; though that practice has, in some cases, been periodically employed on cultivated ground. This implement is so made, as to pare off the surface of the earth to any requisite depth.

The trench-plough is a skim-coultered plough, invented or improved by the late Mr. Duckett, already mentioned. It is furnished with two shares, one directly over the other;
so that one narrow, superficial furrow may be drawn from the surface of the ground, while another is taken off beneath, at a moderate depth. The trench-plough is admirably calculated for ploughing in green crops, or long muck, by way of manure; whatever is thus turned, in being really covered, so that the surface is entirely cleared from all weeds, and fit for the reception of any succeeding crop. Farther, should the surface of the soil be foul, it may be turned under, and fresh soil brought up from the depth of ten inches, by employing the force of three horses; thus, the earth being loosened, the roots of plants are enabled to strike downward without encountering any obstruction; and, while the ground is drained of superfluous moisture, it is exposed to the influence of the air, and consequently greatly ameliorated.

To the list of ploughs for breaking up stiff, clayey lands, may be added a strong, effective implement, called a miner, from the circumstance of its opening, or rather loosening, soil to a great depth. It has simply a share, without any mould-board or plate whatever; and may be advantageously employed for eradicating those weeds which take deep root. The price of a miner is about three guineas.

Drill-ploughs. Since the new or drill husbandry has been generally adopted, numerous drill-machines have been invented, and which possess various degrees of merit.

This useful implement was invented by Jethro Tull, a man, whose talents and ingenuity, ever devoted to the welfare of his country, will be held in grateful remembrance so long as agriculture is considered as a primary object of attention. Since his time, various improvements have been made and suggested; among those more deserving of notice are, Mr. Young's, which is asserted to be calculated for the stiffest soils, and to deposit seed in drills cut through clay-fields, without any previous ploughing ("Annals of Agri-
2. Mr. Amos's *drill-plough* is stated (in his treatise, entitled the "Theory and Practice of Drill-husbandry," 4to.) to sow any kind of seeds, in any quantity, at any required depth, and to perform its business expeditiously, and with facility of draught.— 3. Mr. Cook's improved drill is a useful implement, which has been found to answer the purpose on dry soils, and in some cases with equal advantage on strong, clayey, and loamy lands*. The price of this implement with its corresponding tools, is, we understand, about 40l.— 4. Several useful improvements—and alterations in drill-machinery have been suggested by the late Dr. Darwin, and also by Mr. Swanwick, of Derby, ("Phytologia," 4to. p. 608 and foll.); all of which contrivances being too complex for description, to convey any correct idea of them, we trust this notice of them will be sufficient. We pass them, therefore, omitting numerous common drills, which have been found to answer their respective purposes very well, and proceed to notice two drill-machines of recent invention, the simplicity of whose mechanism (and simplicity is, in the present case, of primary importance), facility of working, and comparative cheapness, render them more worthy of general notice.

The first of the implements alluded to is, the Rev. Mr. Munning's *turnip-drill*, for the invention of which he was (in 1801) honoured with a premium by the Society of Arts, ("Transactions of the Society for the Encouragement of Arts, &c." for 1801); and of which the annexed figures will convey an adequate idea.

* A minute account of this machine, and of its application, has been published by Mr. Cook, in a small tract entitled, "Drill-Husbandry perfected," 12mo.
The machine consists of a barrel-shaped box, that is fixed to the axis of a wheel, about twenty-two inches in diameter, and vertical with such box; during its revolutions, it deposits the seed through certain openings in the middle of the barrel, that are about fourteen inches apart.

Fig. 1. A represents the wheel, with an iron rim.

B is the tin barrel, or seed-box, that is fixed to the axis of the wheel; A C the aperture through which the seed is introduced into the box, and which opening is afterwards closed with a cover.

D is a semi-circular tin plate, intended to remove all impurities and extraneous matters from the seed-box.

The letters E E denote the two handles of the implement.

Fig. 2. F describes the seed-box; B on a larger scale; G the holes in the tin barrel, or seed-box, through which the seed is dropped upon the soil; H represents that part of the wheel's axis, to which the seed-box is attached.

In his communication to the respectable society above named, the inventor considers this turnip-drill to be greatly superior to any former machine, from the circumstance of its depositing seed so immediately after the plough, as to
preserve all the good effects of the first evaporation, which, in his opinion, is greatly conducive to the vegetation of minute seeds. Thus, in six acres of drilled turnips, there was not a deficiency of six square yards; whereas, on half that quantity, or three acres broad cast, before rain fell, not one-half, perhaps not one-third, of the seed vegetated.

Fig. 1.

These figures represent Mr. Knight's improved drill-machine for sowing turnips, for the invention of which he was also honoured, in the same year, and by the same society, with a silver medal.

Fig. 1. A is an iron wheel, which, running on its edge, formed by two concave sides, makes the groove in which the seeds are deposited.

B, a wheel which moves on the same axis as the wheel A, and which, by means of a strap, turns another wheel; C that gives out the seed.
D is the tube through which the seed falls into the channel made by the iron wheel A; E the feet of the machine.

F represents six lengths of a jack-chain, which Mr. K. has found to cover the seed perfectly, and conceives to be preferable to any harrow, as it cannot be impeded in its course by the loose straw that often occurs on the surface of recently manured land.

G the seed-box; H, H the handles of the implement.

Fig. 2. is a delineation, on a larger scale, of the seed-box G, fig. 1. The wheel C is the same in both figures; it is fixed on the axis of the cylinder I, the surface of which is pierced with holes, described at K, for dropping the seed. This cylinder revolves within a groove at the bottom of the box, to which it is so firmly fixed as to admit the passing of no seed, unless it be delivered by the holes K.

L is a strickler, or small brush, that rubs against the cylinder, for the purpose of dislodging any seeds that may remain in the holes. The seeds fall into the tube beneath the cylinder, from which they are conveyed into the furrow, or channel, made by the indenting rim of the iron wheel A, and are then covered with soil by the loose jack-chains F.

Fig. 3. is a front view of the wheel, representing its edge; the angle which forms that edge must be made more or less acute, and the machine be made proportionably strong, according to the stiffness or lightness of the soil. Mr. K. states, in his communication to the Society of Arts, that he has occasionally added leaden weights over the axis of the wheel, but adds, that they will be seldom wanted; as he has tried the implement on various soils, and with equal success. And as the delay of a few days often materially affects the future growth of a crop of turnips, great benefit may be derived from the use of this
machine at a time when the teams are occupied with other farm business.

The labour of using Mr. Knight's drill-machine is so easy, that one man may, upon an average, drill four, or sometimes more, statute acres in one day; the rows being eighteen or twenty inches asunder, and the plants six inches distant in each row. It will, however, be proper either to harrow the ground across, or to roll it, before the implement is used, that the labourer may see the rows he has made; but Mr. K. observes, that he always found the crop succeed better after being rolled than after the use of the harrow, even in very strong lands. We have been thus, we trust not unnecessarily, diffuse in describing the two machines last noticed; as, independently of the simplicity of their construction, they are obviously capable of being applied to the drilling of other seeds than those of turnips, by varying the proportions, or enlarging the apertures, of the seed-box, as circumstances may require.

Lastly, there is a simple machine, denominated a hand-drill, or drill-barrow, which is well calculated for distributing small seeds. The principal part of it is a wheel, about twenty-two inches in diameter, and made of solid deal, on the axle of which is fixed a notched roller, two inches and three quarters in diameter, and two inches in length, that turns in the fore part of the drill-box. The quantity of seed to be distributed is regulated by a slider, which moves upward and downward in the fore part of the box, by means of an adjusting screw fixed at the top, and has a strong brush, or strickler, that projects from its lower end, and sweeps upon the notched roller. There is also a sluice, or slider, which lies flat on the bottom on the inside of the drill-box, and projects between the two handles of the drill, so as to be within the reach of the person guiding it; who, pushing the slide forwards, thus perfectly covers the notched roller, and prevents any seed
from being dispersed while turning the drill at the end of the ridges. With this machine, it is said, a woman or boy can drill from two to two acres and a half in one day, the rows being twenty inches asunder. The implement here described is much used in the lowlands of Scotland; but, as it sows only one row at a time, much advantage would be derived, in point of dispatch, and especially in the saving of labour, if it were constructed so as to drill several rows at the same time, and the apertures also made capable of being regulated with regard to the distances for putting in various seeds.

Having thus described the most important ploughs in use for the more general branches of husbandry, we proceed to notice those which are more peculiarly calculated for affording assistance in the drainage of lands.

One of the most useful ploughs, of this description, is the mole-plough, invented by Mr. Adam Scott, who was, in 1797, honoured with a premium by the Society of Arts. It is composed of a couler that is fifteen inches long, by two and a half wide, for the purpose of cutting the sward; behind this couler is fixed a horizontal, cast-iron cone, twenty inches in length, and two inches and a half in diameter at the base; to the middle of which is fastened an upright bar, two feet in length, and three inches and a half in breadth, with a sharp edge. In pleasure grounds, and other situations, where the surface of the land is an object of regard, this plough will be found very useful for making temporary drains, as the mark made by the couler speedily disappears. A man and boy, with four horses may, it is stated, with ease, drain thirty acres a day; it will, however, be necessary, in using this implement, to make an open ditch at the lower side of the ground intended to be drained, for carrying off the water from the furrows or drains, which should be formed at the distance of ten or fifteen feet, in straight lines. And it is
suggested, that in very wet lands, or seasons, it may be advantageous to employ eight, nine, or a larger number of horses; because, each animal drawing less, the feet will not sink so deeply into the ground. The expense of this implement (in 1797) is stated not to exceed two guineas and a half.

This implement has received some improvements from the hand of Mr. Watt, who obtained a patent for the same in 1797. The most material alteration is, that Mr. W. has applied a cast-iron, or steel, rolling cutter in the beam of his drain-plough, instead of the couler which Mr. Scott has fixed in the usual manner by means of wedges; three cutters are also added, for the purpose of being occasionally substituted for the rolling cutter. In drawing this implement, which is much used in the midland counties, from four to eight or more horses will be necessary, according to the nature and depth of the ground intended to be drained. For general purposes, the common draining-plough, which is too well known to require minute description, is an effective implement.

The latest drain-plough, which deserves more particular notice, is that invented by, or under, the direction of the late Duke of Bridgewater, and which is delineated in the subjoined cut.

A B represents the beam of the plough.
C D are the handles.
E is the sock, or share.
F is the coulter, or first cutter of the sod, which is attached to the share.

G is the second cutter, or coulter, which separates the sod from the land, and forwards it through the open space between F and G. This second cutter is connected with the share, and also with the beam.

H I the sheath of the plough.

K is the bridle, or muzzle, to which the swingle-tree is fastened.

L M two cast-iron wheels, which may be raised or lowered by the screws N pressing on the flat irons O O, to which the axis of each wheel is fixed. The object of these wheels is to regulate the depth to which the share is to penetrate the soil.

P is a chain, provided with an iron pin for moving the screws at O.

In his communication to the Society for the Encouragement of Arts, &c. ("Transactions," vol. xix,) the Duke of Bridgewater observes, that the best time for making use of his implement is about Michaelmas, or immediately after the grass is eaten off; between which period and Christmas the whole operation ought to be completed. On clay soils, that have never been drained, six horses will be requisite to draw this drain-plough; but, in succeeding years, four horses may, or will be necessary, to draw it through the same furrows or gutters. In stiff, flat lands, the implement cannot go too deeply into the ground; though, on declivities, five inches will in general be sufficient; but, on soft and light soils, it ought to be directed as deep as possible, as the sides are apt to crumble and fall into the gutters.

Before we conclude the subject of ploughs, it may not be altogether useless to state, that a useful contrivance was suggested by the late Mr. More, (many years secretary to the society above named), for the purpose of ascertaining the force necessary in the draught of various ploughs. It
SCARIFIERS AND HOES.

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consists of a spring coiled within a cylindrical case, which is provided with a dial-plate, numbered in the same manner as that of a watch or clock. It is so constructed, that the hand moves in consequence of the motion of the spring, and points to the number according to the force exerted; so that if the draught be equal to one hundred weight over a pulley, the hand will be directed towards the figure 1; if it be equal to two hundred weight, the hand will point to the figure 2; advancing or diminishing according to the exertions made*. There is also a contrivance for measuring draughts, invented by Mr. Salmon, whom we have noticed in the preceding section; but, not having seen this piece of machinery, we cannot state the principles on which it is constructed. Its price, we understand, is about three guineas.

SECTION IV.

Scarifiers and Hoes.

Scarifiers and scufflers are implements which have only been employed within a few years. Their size and form are various; and, as it would be impossible to convey an adequate idea of their construction without the aid of numerous engravings, we shall only notice concisely those held in most esteem. Such are Mr. Cook's scarifier and sculler, which form part of his drill-machinery, the full price of which is 40l.—Mr. Lester's cultivator, who (in 1801) obtained a silver medal from the Society of Arts for his invention, the merit of which has however been contended; it having been asserted to be known long since in North Britain, under the name of an edge* ("Farm. Mag." vol. iii.)—Mr. Hayward's extirpator, or scalp-plough, which is a useful implement of the kind, and well calculated for de-

* "Annals of Agriculture," vol. i.
stroying weeds, and clearing land for the reception of seed. It consists of a beam seven feet long, which is furnished with two handles; the shares are eight inches broad, nine long, and are fastened to stalks about ten inches high, and eleven inches apart. It possesses the advantage of being fixed to the wheels of a common plough; does much work in a short time, as it may be worked by any person capable of directing a plough; and will turn over one acre an hour without fatigue to the teams, which should consist of two, three, or more horses, according to the nature of the soil.—Mr. M'Dougall's, of Oxford Street, scarifier, of which the annexed cut, made from an original drawing of the tool

![Diagram of the scarifier]

is a cheap and effective implement, that has been employed with great success.

The practice of scarifying grass lands, indeed, is of late date; but, where the beauty of the lawn is not regarded, it is very beneficial, as it conduces greatly to increase the quantity of hay by loosening the surface, so that the roots have fresh power of vegetation. The use of the scarifier is particularly advantageous before the laying on of manure; under the old practice of rolling, which is asserted to render the surface hard and tenacious, much difficulty was incurred in order to get the manure below the surface to supply food for the roots; on the contrary, by the careful use of the scarifier, this inconvenience is completely obviated, by the ground being opened so that the roots immediately receive
SCARIFIERS AND HOES.

whatever quantity of manure may be laid on, by which means a saving in that important article is effected, as a small quantity, so applied, goes as far as a much larger proportion strewed after the old practice.

Hoes are useful tools, which have long been employed both for garden and field culture. They may either be used by hand, or drawn by horses. In the latter case they are called horse-hoes, and are well calculated for hoeing drilled crops: of this description are, 1. the tool invented by Mr. Amos, which has moveable shares, so that it may be varied according to the distances at which the seed may have been drilled; and, 2. Mr. Cooke's horse-hoe, forming part of his drill-machinery; as, however, his shares are fixed, this circumstance, perhaps, renders his implement, though otherwise an admirably effective one, less preferable than the former.

Among the various hand-hoes that are deserving of notice, those invented by the late Mr. Ducket are eminently useful in mellow soils. He has availed himself of a short handle, towards the bottom of which is an iron ring, or loop, for holding a strap that is fastened round the waist of the labourers as they walk backwards. This circumstance, together with the heavy iron work, gives the implement much power, and renders it very effective*.

The scuttle, or Dutch hoe, is used principally in cutting up weeds, and loosening the soil around esculent plants. It is of various sizes, each being fixed on handles from five to six feet in length; and the cutting plate, which is seven or eight inches wide, being open in the middle,

* See "Communications to the Board of Agriculture," vol. ii. in which is given an engraving of Mr. D's hoe. Similar implements have long been used in Portugal for hoeing the vineyards situated in strong soils; they are forcibly recommended to the notice of British agriculturists by Lord Somerville, in his "System followed during the two last Years by the Board of Agriculture." 8vo. 1800.
that the earth and weeds, in hoeing, may fall through the
open part without impeding the operation.

Another useful implement, of this description, is the
prong-hoe, which is chiefly used for the purpose of hoeing
or breaking the ground, near or among the roots of plants:
It consists of a handle, five or six feet in length, to which
are attached two hooked points, six or seven inches long;
when stricken into the soil it will stir and turn it to the
same depth as a plough, thus answering both intentions, viz.
that of opening the ground, and of cutting up weeds. The
prong-hoe is an effective implement, particularly in horse-
hoeing husbandry, when the plough can only come within
two or three inches of the rows of vegetables; as, by means of
it, the land may be stirred to the very stalk of the plant.

The next implement belonging to this class, which is
more peculiarly worthy of notice, is Mr. M'Dougall's
improved hoe, represented in the subjoined cut.

It consists of two principal parts; the first of which is a
beam of wood, having at its fore-end a semicircle that forms
two handles, between which one man walks and draws the
tool forward. At the other end, this beam is divided, and
moves on two small gudgeons, by which it is accommodated
to the height of the hands of the person drawing, and room
is allowed for the movement of a wheel. The farther end
of the opposite beam is held by another person, who guides
the hoe, and regulates the depth to which it enters the
ground, at the same time assisting its action by pushing it
forward. The fore-end of this beam is likewise divided, so
as to admit a wheel to run between the sides, which serves
to regulate the depth, and at the same time to ease the draught in working this instrument.

The hoes, or cutting plates, are made of cast iron, and morticed in the hinder beam by means of a proper wedge; their size and dimensions may be varied according to the peculiar nature of the work. The object of this implement, which is effected in an eminent degree, is to eradicate weeds from land, and to loosen the soil in the intermediate spaces of pulse, or grain, sown in equi-distant rows, while the plants are at the same time properly earthed up, and consequently vegetate with increased luxuriance.

Notwithstanding the implements already noticed are sufficiently well calculated to answer the purposes for which they are designed, it has been suggested, that the operation of hoeing may often be performed with advantage on higher soils, where the intervals between the rows are tolerably wide, with any small plough of the common construction, having a sharp and broad share. Dr. Anderson has suggested the use of a double mould-board plough for this purpose; and, in the second volume of his interesting "Recreations in Agriculture," he has given a minute of the successful practice of this method, which is stated to be peculiarly adapted to the clearing of weeds, &c. from cabbages, round which the earth is heaped, so that their vegetation is greatly promoted. It appears, however, that double mould-board ploughs cannot be effectually employed, with this intention, on lands under the drill husbandry, on account of the difficulty attendant on the adjusting of the shares to the width of the rows, which sometimes varies a little. Hence, notwithstanding such variation may not exceed one or two inches, the work is of necessity incompletely done, as the mould cannot be properly raised around the roots of the plants; so that a small common plough, as above mentioned, may be preferably employed to a double-breasted instrument.
We cannot, however, omit in this place to notice a valuable hoe, invented a few years since by the late Mr. Ducket. It is made entirely of iron, including the carriage, and is composed of two common plough-shares, which work from twenty to twenty-four inches of ground in breadth, in proportion as they are winged. These shares are fastened, by means of wedges, into a twisted beam, and the whole is put together with such solidity and strength, that the implement may be worked with four horses at any requisite depth. These hoes are chiefly calculated for clearing bean and pea stubbles for the plough, which purpose they attain with such effect, that it is stated, the land may be sown, even although the ground may not have previously been ploughed.

A useful contrivance has been invented by Mr. Parkinson, an ingenious and practical agriculturist, ("Experienced Farmer," vol. i.) for the purpose of eradicating tap-rooted weeds, which often resist the action of the scarifier, when its edge is blunted, so that they are dragged down and continue to vegetate. This tool is asserted to be superior to the scarifier, or plough, for such purpose; but can only be employed on light land, where the fallow is well broken, and nearly clean of twitch or couch. Mr. P's implement is of a triangular form, having a beam, beneath which are two small wheels to run before it, in the same manner as in the Norfolk plough. There are three coulters, under each of which is riveted a share, about fourteen inches in width, and the point of which is made sharp like a fleam. These coulters penetrate to the same depth as a plough; and, without materially moving the soil, cut up thistles and other weeds much better than any other implement which has hitherto occurred to his notice. And, in case those weeds are very numerous, Mr. P. employs a beam with one wheel, into which he puts one of the coulters, to cut between the rows of the drills. This extirpator, for so we think it may
HARROWS.

with propriety be termed, will penetrate to any depth that may be required; and that which is provided with three shares will, according to the inventor's statement, do as much work in one day as three ploughs.

SECTION V.

Harrow

are implements of essential importance in the management of farm lands, not only for the purpose of covering the seed with earth, but likewise for pulverizing the soil, previously to its reception of seed.

The most simple instrument of this description is the bush-harrow, which is chiefly used for the purpose of harrowing dung, or seeds, into grass lands. It consists simply of a frame, the fore-part of which is raised by means of two wheels, and into which frame some sort of bushes are interwoven.

The most common harrow is the brake, a large and weighty instrument, employed in reducing stubborn soils, and other purposes. It consists of four square bulls, each side being five inches thick, and six feet and a half long; the teeth are seventeen inches in length, and bend forward in the manner of a coulter; four of these teeth are inserted in each bull, being fixed above with a screw nut, having twelve inches free below, with a heel close to the under part of the bull to prevent it from being pushed back by stones. Four horses, or oxen, are necessary to draw this apparatus, which is eminently calculated for pulverizing stiff clays.

There are other harrows in common use for harrowing ground, which are of a lighter construction, and of which two, or a larger number, are usually chained together; and though they in general answer that purpose sufficiently well,
they are nevertheless often liable to be thrown out of work by stones, while much time is necessarily lost in turning at the ends of ridges. This inconvenience has been attempted to be obviated by adopting running bulls, which expedient has been found to succeed. A better mode, however, is to couple the implements together by means of stout hooks and eyes, so that the different harrows rise and fall at the same time without hitching on each other, or requiring the driver to stop at each turn in order to rectify them.

The improvement of harrows has, only within a few years, become an object of particular attention; and, notwithstanding much has been done in a short period for their better construction, they are yet but in a comparatively imperfect state.

One of the most improved harrows, by which the inconveniences above noticed are removed, is Mr. Lester's, who obtained a patent for his invention in the course of the year 1799; and although its structure cannot be detailed without the aid of an engraving, yet we think it will not be altogether useless to state a few particulars, which distinguish this instrument from those in common use. The patent harrows are of various sizes, so that they may be drawn by one, two, or more horses, and may suit every kind of soil: single-horse harrows, however, are preferred by the most intelligent agriculturists to such as require a larger draught. The first size of Mr. Lester's apparatus is six feet wide, and of equal length; the teeth are twelve inches asunder in every direction, and there is an intervening space of one inch and a half between their track in the line of draught. This size is peculiarly adapted to the harrowing-in of seed on lay, flag, or whole land. The second size is seven feet and a half in width, by six feet nine inches in length; the teeth are fourteen inches distant in every direction, and there is an interval of two inches between their tracks in
the line of draught: it is eminently calculated for cleaning foul lands. The third size is nine feet long, and seven feet nine inches broad; the teeth are sixteen inches wide in every direction, and there is an intermediate space of two inches and a half between the tracks in the line of draught. This implement is stated to be superiorly adapted to the culture of foul ground, and particularly for eradicating couch-grass from fen-fallows. As the chief defect in common harrows is their liability to be clogged, so the primary excellence in the patent harrow is the impossibility of its being clogged, or driving the land together in heaps. Being divided into two parts, of equal length, "which are drawn by two centres united in a third," its motion is steady and uniform, and the machine cannot diverge into any oblique direction. Farther, the patent harrow yields to all the inequalities of the soil, and couches over ridges and furrows, so that much time is saved in turning; while, from the diagonal arrangement of the bulls, and the irregular position of the teeth, each tine or tooth is drawn into a different direction; hence no one can follow another in the same track, and consequently the object required of harrows is more completely effected.

An improved iron harrow has been constructed under the direction of Mr. Young; it consists of two iron frames, in which the teeth are diagonally disposed, so that no one tooth can follow another in the same track. In order to give the apparatus greater steadiness and uniformity, each tooth is screwed through a double frame, separated by iron washers; and it is supplied with handles (an indispensable requisite in the construction of harrows,) for the purpose of lifting up or pressing down, as circumstances may require; so that no impediment can arise from lumps of soil, or tufts of weeds, being dragged along. A harrow of this description costs about six guineas: it is much superior to the
common wooden ones, both for effective work, and also in point of durability.

In 1795, Mr. Knight submitted an improved harrow to the inspection of the Society for the Encouragement of Arts, &c. by whom he was honoured with a premium. Its object is to prevent loss of time when turning at the ends of ridges; and, being furnished with wheels, to diminish the draught of horses. This design is certainly effected; but as his machine appears to be too expensive, (though such expense may be lessened, according to the inventor's statement, by constructing the axle-tree and joints of wood), and also rather too complicated to be generally adopted; we pass, therefore, to notice two or three harrows of more simple make, and which seem to deserve more general attention.

In the course of the year 1801, Mr. Wilde obtained a patent for a newly-invented harrow, which possesses a considerable degree of simplicity. When put together for work, the set consists of four harrows, which are constructed in the usual manner, and with the usual number of teeth. These are placed in a direction nearly parallel to each other, and are united by means of three iron links, which are moveable at the part where they are joined to the harrow. The centre link is obliquely fastened, and is longer than the two others, which are set straight; but all the links are disposed loosely, in order that the implement may have room to play. This harrow, or rather series of harrows, is fastened to the bearing bar (to which the traces are attached) by an iron pin, which is affixed to the chain hook, passing through holes made at various distances in the bar, so as to give the exact direction to the machinery; in consequence of such arrangement a uniform course is obtained, and the work is regularly performed. These patent harrows may be constructed of any requisite size; and the horses may be.
placed so as to draw a-breast; or, in case the land be wet and heavy, to follow each other in the same track in the furrow, and thus prevent the soil from being poached.

One of the simplest and, in our opinion, most effective instruments of this description is the chain and screw-harrow, invented a few years since by the Hon. R. Sandilands, which is represented in the annexed figure,

![Diagram of a chain and screw-harrow]

and from which any ingenious mechanic may, we think, construct an implement.

Where the ridges are high, and it becomes necessary to harrow them through their whole extent, the chain and screw harrow is eminently calculated for service; for, by lengthening the chain, which is commanded by the screw, the harrow will, when drawn along, form an angle downwards, and thus pass over every part of the curve of the ridge, according to its extent. This, as appears from Mr. S's account, ("Letters and Papers of the Bath and West of England Society," may be nine feet, the distance from A to B in the figure above delineated; on the contrary, the whole space from C to D is stated not to exceed five feet and a half. After the crowns of the ridges have been sufficiently harrowed lengthwise, the chain may be contracted, or shortened, by the screw, which forms an angle upwards.
The harrow is then drawn by horses, one on either side of the furrow, which will be completely reduced, as also will the sides of the ridges, if eighteen feet broad. Where the harrow is to be drawn over level or even ground, or over high ridges, it may, by means of the screw, be made horizontal, so as to work like a solid harrow without a joint.

The tines, or teeth, in the apparatus above described, are square, and fixed in the usual manner, being nine or ten inches below the wooden frame, and made of such a degree of strength as the nature of the land may render necessary. They tear or cut the soil uniformly every four inches, without being clogged by weeds, &c. except at the extreme angles, where the teeth are of necessity disposed somewhat closely together; but this inconvenience may be easily obviated, and the teeth cleared by elevating them a little from the ground. The figures 1, 2, 3, 4, 5, 6, 7, 8, &c. &c. denote the parts where the twelve teeth are to be fixed on each side of the harrow. But, where the situation or nature of the soil is such, as to render a strong brake-harrow unnecessary, by making the tines shorter, or lighter, forty-eight teeth may be obtained, which will tear the ground at every two inches, effectually cover the seed, and at the same time produce a fine mould. Mr. S. also recommends the construction above specified to be adopted in harrows of every size, and for every purpose; as, from the peculiar arrangement of the tines, no one tooth can follow in the same track with another, while all are kept in constant action.

Lastly, the same gentleman has submitted to public inspection an effective instrument, which he denominates a wrack-harrow, from the speedy manner in which it collects together the wrack, or roots of couch or quitch grass, and other troublesome weeds, after they have been brought to the surface. This contrivance consists of a plank of timber, six feet in length by nine inches in breadth, and two inches
Drags.

These implements are somewhat like scarifiers, and are employed for the same purposes; their construction varies greatly in different counties, so that any description would not contribute to convey any accurate idea of it. The common drag is chiefly used; but, like all other machinery, it is capable of considerable improvement. Mr. Parkinson recommends the duck-footed drag, as being more effective, and consequently preferable to any other; particularly if
the teeth be wedged, instead of being screwed into the wood, so as to admit of their being easily altered and set to any depth that may be required.

SECTION VII.

Rollers.

Rollers are differently made, of wood, stone, and of cast iron; and of various sizes, according to the respective purposes for which they are used. The common rollers are from fifteen to twenty, and thence to thirty inches in diameter, about six feet in length: they are generally used for rolling pasture lands.

In constructing these instruments it will be advisable to make the cylinder of a small diameter, as the degree of pressure necessarily decreases if it rest on too large a surface at one time, unless an additional weight be put upon the frame. This part of the machine ought, therefore, to be very strong; though it will be preferable to place open boxes, or small cars, upon the frame for such purpose, which will at the same time serve to receive any substances that may be picked off the soil. Should, however, the land be stiff, and difficult to reduce, the addition of spikes to the roller will prove of essential utility in bringing the earth to a fine tilth.

SECTION VIII.

Churns.

The structure of the churns in common use is too well known to require any description. The tedious manner in which butter and cheese are made by them, having induced several practical mechanics to invent others, which are less
expensive, and more speedy in their operation, we have selected two that appear more worthy of notice.

The first is the churn manufactured by Messrs. Wright and Co. of Philadelphia, and which is represented in the subjoined cut.

Fig. 1.

Fig. 2.

It is made in the form of a cube, with vertical dashers, as delineated at $a, a, a, a, a, a, a$. B is the top, which takes off. C the spindle, or handle, that passes through and turns the dashers, $a a a, &c$. D D D D describe the form of the churn each way. From this mode of construction, considerable power is gained, and much time saved in working the churn, which is a simple and effective contrivance.

The second is Mr. W. Bowler's improved churn, which, in 1795, was honoured with the notice of, and a premium by, the Society for the Encouragement of Arts, &c. already mentioned in the course of this work.

Mr. B's improved churn is of the barrel kind, being a cylinder, eighteen inches in diameter, and nine inches wide. The sides are of wood, though we conceive tin would be a better substitute, on account of the greater ease with which it may be cleansed. The rim is a tin plate, which has two openings; one eight inches and a half long by four inches in width, through which the cream is poured
into the churn, and the hand is introduced for the purpose of cleansing it; the other, a short pipe one inch in diameter, through which the butter-milk runs out of the churn, when the process of churning is finished. The first of these openings is furnished with a wooden cover, fastened down by means of two screws; and to the other a cork is fitted, while the butter is churning. Nearer the larger opening, there is also a small vent-hole, with a peg to admit the passage of any air that may be evolved from the cream at the beginning of the operation. Farther, an axle passes through the churn, terminating in two gudgeons, on which it hangs; its lower part being plunged in a trough, for the purpose of holding, occasionally, cold or hot water, according to the season of the year. On the inside of the rim are four projecting pieces of wood, with holes, with which the cream is agitated by the motion of the churn. This motion is caused by a pendulum, three feet six inches in length, that has an iron bob of ten pounds weight, and at its upper end a turning pulley, ten inches in diameter, from which a rope goes twice round another pulley, about three inches in diameter, that is fixed on the axis of the churn, which it causes partially to revolve by each vibration of the pendulum.

Besides, the machinery is provided with sliding covers, and the water-trough has another, for the purpose of securing the steam, when hot water is used; and for keeping the cream in a proper degree of warmth. The motion of the pendulum is given and kept up by means of a wooden rod, about three feet nine inches long, which turns on a pin about three inches above the bob of the pendulum. An accurate view of the mechanism above noticed will, it is hoped, be found in the annexed figure.
The letters A A A designate the body of the churn, which may be made of tin, for the reason already assigned.

B, the opening through which the cream is poured in.

C, the cover of the large opening: the small aperture on the opposite side cannot be represented in the cut.

D, the axis, or gudgeon, on which the body of the churn is suspended.

E, the upper, or larger pulley.

F, the smaller pulley, which is fixed on the axis of the churn.

G, the rod of the pendulum, hanging from the upper pulley E.

H, the bob of the pendulum.

I, the handle, moveable on the pin at a, by which the
pendulum is moved, making a traverse in the form of the dotted line K K.

L, the trough for receiving hot or cold water, according to the season, and which may be preferably made of tin, because that metal is a better conductor of heat than wood.

M, a projecting piece of wood, with a shoulder, that supports the handle I, when the churn is not at work.
DIFFERENT SORTS OF SOILS.

CHAP. VI.

DIFFERENT SORTS OF SOILS.—VARIOUS MODES OF IMPROVING AND OF CONVERTING THEM FROM A STATE OF NATURE.—MANURES.—FENCES.—FORMATION AND MANAGEMENT OF MEADOWS.—IRRIGATION.

SECTION I.

Different Sorts of Soils.

Soils have been divided into various classes, according to the nature, quality, and proportions of the various particles of which they consist, and which necessarily influence their fertility. The constituent parts of soils are carbon, lime, clay, and siliceous sand; by analysing which several eminent chemists, of this and of other countries, conceive, according to the respective portions of these ingredients, that the relative fertility of soils may be ascertained. Chemical analysis, however is, in the present instance, at best, but an uncertain guide, as few practical agriculturists can spare the time and expense which it requires; it has therefore been suggested, that the relative fertility of soils may be examined by calculating their specific gravity, when dried at equal distances from the fire, in bladders perforated with small holes; and, after they have been immersed in water, by accurately observing the difference between their respective weight, both in water and in the air. A similar mode of determining this question was suggested by the late Dr. Darwin, who proposed to dry a few pounds of different soils in the same temperature; after the
evaporation of the moisture, they are to be weighed, and exposed to a red heat. And as carbon is the chief constituent of calcareous earths, he conjectured those soils, which lost the greatest portion of their weight, to be the most fertile, as the carbonic matter (which affords the principal nutriment of vegetables) will be dissipated in the flame.

A more certain criterion, however, by which the relative fertility of land may be ascertained, may be obtained by persons of sound judgment and experience; by simply attending to the growth and colour of the different vegetables that are spontaneously produced. Thus the rush, flourishing in cold and wet clay soils, may generally be considered as indicative of such soils; brook-lime, and some species of cresses, abounding in moist grounds; the common nettle in dry, loamy soils; the fox-glove and sandwort in sandy situations; the way-thistle, or corn saw-wort, (Terratula Arvensis, L.) in good soils; the common dock in inferior grounds; all characterise the different varieties and descriptions of soil. But, after all, the best guide in ascertaining this point will be experience, the result of long and frequent attention to numerous local circumstances; as the remarks hitherto made by naturalists are neither sufficiently full nor extensive to afford any standing rules.

Soils may be divided into the following classes:

1. Vegetable mould, 4. Sand,
2. Clay, 5. Chalk,
3. Loam, 6. Peat,

each of which comprises several varieties that will be noticed, according to the proportions of the various ingredients of which they are composed.
§ 1. Vegetable Mould.

Vegetable mould, sometimes called the staple, is almost everywhere spread to a greater or less depth on the surface of the earth; it is formed by the dissolution of vegetables, and may be augmented by the application of manures, vegetable, fossil, and compound. Every kind of mould does not possess the same degree of fertility; thus, that which lies in shady situations is generally richer than what is exposed to the sun. Its fertility is also affected by the nature of the acid which accidentally adheres to some sorts of mould, and which is either 1. vegetable, arising from stagnating water, or, more correctly, from stagnating water, which is dissipated by exposing the mould to the solar heat; or 2. mineral, which is not dissipated by drying in the sun, and arises from water brought to it, that is charged with such mineral acid. The former is of material use in impregnating soils, provided its rich particles be not washed away; which is necessarily the case, when the turf is alternately overflowed and dried. The latter must be divested of its acid, before it can be used with advantage. In dry years, mould becomes too loose, so that all its moisture escapes by evaporation, and thus it easily loses all its richer particles. Farther; in this loose state it cannot be easily frozen into one mass, but rather into small pieces; hence the roots of plants are easily torn asunder, and the cold is admitted to them, and they are consequent-ly destroyed. Under such circumstances, it will be necessary to resort to the use of perfectly-extinguished lime, in combination with various saline matters, in order to render the vegetable mould productive, and to reduce it to a proper state.
§ 2. Clay.

Under this denomination are included the various sorts of land usually denominated lime-stone clay, strong land, stiff land, strong loam, stiff loam, and marmy clay, all of which differ greatly in their qualities and properties, and also in their greater or less tenacity and colours. Clayey lands are naturally steril, from their adhering together in masses; unless indeed a summer be so divided between rain and sun-shine, that they are kept in a medium continually between drought and wetness; a circumstance that rarely happens in this variable climate. In wet seasons, plants growing on such soils are inundated; the closeness of the clay will not let the water soak into the ground; and, in a dry season, the ground becomes so solid, that the roots of plants cannot penetrate. A tolerably-accurate idea of the fertility or barrenness of clay soils may be obtained, by regarding the appearance of the different plants as they vegetate; if they appear lively and vigorous, a favourable opinion may be drawn; the reverse of course follows, if they appear languid, unhealthy, and stinted in their growth.

Clay is thought to contain more of the food of plants than almost any other soil; without much alteration, such lands will produce good crops of grass, provided care be taken not to feed them too closely, nor to admit cattle into them in the spring. In order, however, to bring them into tillage, it is necessary that clay soils be altered by the admixture of such substances as tend to open the soil, and to break the cohesion of its particles. When once this object is accomplished, the land will become highly valuable, retaining manure excellently well, and never returning to its former state.

Clay lands are capable of great improvement, by the judicious application of manures, and a regular course of tillage. With regard to the former, limestone, gravel, and
Diferent sorts of soils.

Marl are the most useful articles; the best season for laying on, which is in the month of January, as it is only during winter, while the surface is frozen, that teams can stir. Where those fossils cannot be procured, a mixture of dung and sand (beach sand is preferable to that obtained from pits) will contribute to fertilize the ground. The application of lime alone has, in many instances, been attended with great advantage; though some eminent agriculturists disapprove of it, on account of its being apt to cake, and not mixing intimately with the soil. A variety of substances may likewise be employed in case of a deficiency of those fossils, such as composites of chalk and dung, tanners' bark, and other manures, that promote a strong fermentation. And it has been found by experience, that chalk and these together not only enrich the soil, but also make it produce earlier crops than it did before. The chalk, indeed, thus laid upon the land, at length subsides, settles as deep as the plough goes, and is then of no farther value in opening the land; but it may be recovered, and brought up again to the surface, by ploughing somewhat deeper than ordinary; after which it will produce its former good effects. Gravel, from neighbouring soils, may also be carted upon clay lands; to which may be added sea or pit-coal ashes, dust from saw-pits, chips, and rubbish from the back yards of houses, straw and stubble, rotten wood, burnt clay, peat ashes, and perhaps gypsum, or plaster of Paris.

With regard to the second point essential to the improvement of clay lands, viz. tillage; after such soils have been sanded, or any other manure, calculated to open it, has been carted thereon, it will require several ploughings and harrowings to mix it, so as to bring the land to a good consistence. The depth of ploughing on such lands varies according to circumstances, and their respective peculiar situations. Farther, as clay soils retain moisture
longer than any others, they ought to be kept as dry as possible; as the stagnation of water not only renders them acid, but also materially injures the crops. Lastly, suitable seasons should be embraced for ploughing clay soils, when they are neither too wet nor too dry; as, in the former case, it will become poached with the feet of the cattle; and, on the other hand, when it is very dry, it cannot be well turned on account of its tenacity and stiffness. At the first ploughing the clay comes up in large clods, but the oftener it is stirred with the plough, at proper times, the more is the cohesion of the particles broken, and the more easily can the roots of plants penetrate deeply in search of their food.

§ 3. Loam.

This species of earth is more compact than chalk, and less cohesive than clay. It is divided into several varieties, according to the substances or ingredients of which they are composed; the constituent parts of which are clay and coarse sand. Clayey, strong, stiff, and, as it is sometimes called, heavy loam, consists of a mixture of coarse sand and clay. The sandy loam contains similar ingredients with the preceding variety, although the sand prevails in a larger proportion.

Loamy soils being, in general, less tenacious and more friable than clays, are capable of being more easily improved with less expense and labour of team, and also at any season of the year. The manure proper for such soils varies according to their relative degree of fertility, and the greater or less proportion of acidity, and of argillaceous and calcareous matter they contain. Those loams, which are contiguous to the banks of rivers, or the sea-coast, are generally admitted to be so fertile as to require little additional aid from manure; but for the more heavy compost and adhesive kinds, a compost of lime and dung, or lime in
DIFFERENT SORTS OF SOILS. 277

combination with pulverized or ground bones and blood, or other animal recrement, and such terrene substances as contain large quantities of sand, may be beneficially applied in such quantities as the tenacity, or poverty, of the land may require. Where the argillaceous principle abounds, lime alone may be spread on the soil, in order to counteract the acidity prevalent in such soils; in the contrary case, or where there is an abundance of sandy, gravelly, or chalky particles are duly mixed with the loams, well rotted dung, vegetable manures (see these specified infra Sect. III.), and the mud or deposition procured from stagnant waters, may be spread to the greatest advantage; and, in case the loam be too friable, or light, a quantity of clayey loam may be carted on the land, sufficient to impart a proper degree of cohesion.


Gravelly soils are composed of gravel, of various degrees of fineness, which is either siliceous or flinty, or calcareous or chalky. Such soils are very porous; and, though they receive moisture with facility, yet as they part with it with equal readiness, they are apt to burn during the intense heats of summer, unless this effect be prevented, or removed, by the use of marl, or other fossil manure. For calcareous, gravelly soils, clayey loam is the best remedy; or chalk and clay, or extinguished lime and clay, may be applied with advantage. Besides which, there are various composts of animal and vegetable recrement that may be employed with the same intention; such as well-rotted farm-yard manure, combined with ashes, mud, loamy mould, &c.

Sandy soils are composed of calcareous, siliceous, or stony substances, of various colours, according to the different matters with which they are mixed; black, white, red, or yellow. From their tenacity, sandy soils cannot be
cultivated with advantage, without the aid of other fossil manures to counteract their poverty, and prevent the continual evaporation of moisture. For this purpose clay and loam may be beneficially spread on sandy soils, which may likewise be improved by the use of composts of animal and vegetable manure; though, where these cannot be obtained, good mould or earth may be employed with advantage; as also may peaty earth, either alone, or in combination with other matters. A degree of tenacity, or firmness, may also be imparted to sandy soils by the treading of sheep, folded upon them, while they receive much benefit from the dung and urine deposited by those animals.

§ 5. Chalk.

Chalky soils occur in various parts of Britain, in large tracts, and of various descriptions, according to the nature and quantities of calcareous matter which they contain, the depth and qualities of the layer of earth which lies upon it, and the substances that are confined with it, as well as the substratum, or sub-soil, in which the earth is deposited.

The utility of chalk and lime, as a corrective of other soils, has already been intimated; from the burning property of these fossils, however, they require to be mixed with other matters, to render them more fit for the purposes of vegetation. Thus, in the thinner or lighter calcareous soils, clay or clayey marl, and the vegetable recrement obtained in wet or swampy situations, may be beneficially applied. In soils of a contrary or heavier nature, the spreading of sandy and clayey loams, as circumstances may require, will be attended with advantage. To these may be added composts of various vegetable and animal substances, farm-yard manure, and ashes; beside which great attention is requisite in breaking up these soils at the proper season; as, if this operation be deferred till a dry
DIFFERENT SORTS OF SOILS.

season, they become so bound, or hard, that it will be impossible to work them, until they are softened by rain, without very great expense both of teams and of labour.

§ 6. Peat.

Under this denomination are included those soils, which in England are called moory, peaty, and boggy, or fenny soils; and in Scotland they are termed mosses. Various theories have been formed to account for the formation of peaty soils; but, from every enquiry that can be made on this head, they appear evidently to have originated from the roots of trees and other decayed vegetable matter, supplied by the dissolution of plants flourishing in humid situations, as also by other substances brought down from surrounding high grounds, and there gradually deposited.

According to the nature of the vegetables forming these soils, the peaty matter is found in different places of different depths and degrees of closeness, as well as of colour; this depth varies from twenty to fifty, and sometimes more, feet, and the colour is chiefly red or black, intermixed with various shades. Peaty soils are extremely porous, and consequently very retentive of water; and where they are very deep, they are rarely free from the excessive humidity with which they are loaded in consequence of long continued rains.

As peaty soils thus necessarily vary according to the substances that enter into their composition, various methods of treatment become requisite, in order to prepare them for the different purposes of husbandry.

In deep, boggy, or mossy soils, then draining (where it is practicable) ought to be resorted to in the first instance, in order to draw off the excessive moisture. Various hard, dry earths will also be found of great use in improving bogs, such as gravel, chalk, stones, sand, shell-marl, &c. as these substances contribute to bind, ameliorate, and
warm the soil, while they prevent springs from oozing up and overflowing the surface. Should they be overrun with heath, rushes, and similar coarse vegetables, quicklime may be beneficially applied; paring and burning, (provincially termed denshiring and burn-baiting), may likewise be resorted to with advantage. Another useful mode of reclaiming such soil is, by planting thereon those vegetables whose spreading roots serve to bind the earth together, and at the same time, in a great measure, exclude the action of the atmosphere upon it.

Lastly, irrigation, or flooding of mosses, where a command of limpid current water can be obtained, is perhaps the cheapest and most efficacious way of reclaiming them; cases at least have occurred where such soils have been brought into a state of cultivation, for meadows, with the happiest success, which had failed under contrary methods of management. The manner in which such flooding is to be effected will be specified in a subsequent section of this chapter.

SECTION II.

DIFFERENT MODES OF IMPROVING LAND.

§ 1. Draining.

Few operations are more important in the improvement of land than that of draining; for, though vegetation cannot proceed without an ample supply of water, yet there are cases where there is such a superabundance of that element, as to be productive of the most injurious consequences to the health of plants, and especially to persons who reside in the vicinity of such swampy situations.

It is, therefore, of the utmost importance to the farmer, that he duly consider the cause of the excess of moisture,
which is thus prejudicial to his interests, and to rectify it accordingly. Various methods of draining have been suggested by ingenious men, which are applicable to various soils. If then the land be not marked by any strong inequalities of surface, and the wetness proceed from the texture of the soil, particularly the substratum; the system of hollow draining, applied to the whole surface, is, in Mr. Young’s opinion, the best cure the evil will admit. On the contrary, where the land is situated on a declivity, springs break out on the slope, which greatly damage the land below; in this case, a different system of management must be adopted, as the common methods of draining are rarely adequate. In discussing this important branch of rural economy, therefore, we shall first state the various methods of draining, applicable to lands of the first description, and then proceed to notice that system, or plan, which is best calculated for those last noticed, viz. uplands.

I. With regard to lands which are not marked by any striking inequalities of surface, in the counties of Essex and Herts, (which contain many districts of this nature), the method of cure resorted to is hollow draining, or land ditching, as it is sometimes termed. It consists in digging main and side drains, like those commonly made in draining land; the depth of the main drains varies from twenty-two to twenty-four inches. That of the side drains from twenty to twenty-two inches. The soil is first ploughed; and the length to which the main drains may be continued without a vent, depends on the situation of the land. If it has a gentle slope, it will be proper to carry off as much water as possible by means of side drains; sometimes, however, the surface of the ground is unequal, in which case it becomes necessary to form additional main drains.

The length of the side drains depends on the greater or less elevation of the soil; in general, one rod is a sufficient interval between each; but in very porous or loose grounds,
they may be made one rod and a half asunder. The trenches being cut of a sufficient depth, they may be filled up with stones, if these can be procured, brush-wood, bones, straw, fern, heath, &c. and the surface earth laid on ar
c'hways. In making drains of this kind, the chief object, in the opinion of the most experienced drainers, is not dur-
ability of the materials, but the proper arcing of the earth, which will remain perfect when the other materials are decayed. In several parts of Essex there are drains thus made, which run very well, although they were filled only with straw upwards of thirty years since. The ex-
pense is about 3l. per acre.

Sod or earth drains are usually dug to the depth of two feet with a spade, after which the earth is removed by means of a scoop, about four inches in width; and the drain is covered with the soil first taken out, if the ground be sufficiently firm to sustain their weight; if not, some black-thorn bushes are put in for that purpose.

Another method of making common earth-drains con-
sists in digging two or three spits deep with a broad spade, and excavating the bottom with a narrow one, after which the drain is filled with stones. Or a furrow may be drawn with a plough, and cleared with a common spade; the draining implement, delineated in the annexed fig. 1, is then to be introduced to the depth of one foot and a half from the surface; and the loose mould to be removed by the scoop, represented in fig. 2.
along the bottom should be laid heath, or black-thorn bushes, covered with strong wheat straw, closely twisted to the thickness of a man's leg; after which the whole is to be carefully closed in. In all cases, the apertures, or mouths, of drains ought to be effectually guarded by a railing, or grating, to prevent the water-course from being obstructed by the treading of cattle attempting to drink at it. And the passage for the water at the bottom should uniformly be narrow, as the force of the water will be fully adequate to remove any accidental impediments to its course, and consequently such drains will be more durable.

Where the common methods of draining cannot be adopted, stone drains may be resorted to with advantage. They should be cut ten or twelve inches wide, with perpendicular sides; and flat stones be so disposed as to leave a water-course at the bottom, by setting two stones in such a manner as to meet triangularly at the points. Or flat stones may be placed along the bottom, and three others placed upright, and the water left to work itself a passage between them. At all events, the cavity of the drain should be filled nearly up to the top with loose stones, for which screened gravel may be advantageously substituted, where a sufficient quantity can be commanded. The principal drains ought to be three feet in depth, by one foot and a half in width; the top and bottom laid with flag-stones; the sides raised, or built up to a sufficient height with common stones; the whole being covered with sods of turf, with the sward or grassy side downwards, and over these is to be spread sufficient earth to admit the plough. In general, the smaller drains are to be conducted into the main trenches at an acute angle.

Within a few years, a peculiar mode of draining land with chalk, as a substitute for stones, has been successfully practised in the county of York. The trenches are cut in
the common manner, and then filled with pieces of chalk; on these is laid a thick bed, or layer, of evergreen boughs, which again are covered with the sod or earth. The extremities of the main drains are arched to a short distance with brick work, to preserve the chalk from the effects of frost, which will otherwise reduce it to powder, and, of course, injure the drain. By using chalk in this way, the growth of moss is effectually prevented, and a free current obtained for carrying off the water.

In the preceding methods of draining, and indeed in every other mode that may be adopted, it ought to be constantly understood that, where there is a declivity in the field, the drains should have a very gentle descent, lest the water, by a quick current, should hollow the earth, and make itself new channels. On the contrary, the moisture and flatter a wet field is, the more in number, as well as larger, should the drains be made; in fact, they should, in every case, be proportioned to the quantity of water to be discharged, the smaller opening into the larger. And particular care ought to be taken that the drains be of an equal depth, in order that water may in no place stagnate and putrify, and that in arable lands furrows be made to carry the water every where into the ditches; precautions these, which become peculiarly necessary where large quantities of snow are dissolved in the spring, or the place is subject to inundation.

Farther, with regard to the draining of bogs or marshes, where a sufficient fall can be procured, the first object is to ascertain the lowest spot of dry ground that surrounds it, in order to open on that part of the main trench which is to carry off the water; and if there be any trace of a current, or stream, this should be followed with the greatest care, as it may serve to point out the precise spot on which to begin. The main trench, beginning at the lowest part, may be carried on to any distance required; if it com-
mence at the proper spot, ten acres may be detached from the marsh, whatever its extent may be, and perfectly drained. The main cut, or trench, ought to be ten feet broad in the clear, with a proper slope, in order to prevent the sides from falling in and filling it up.

It has been intimated, in a preceding section, that bogs are divided into two parts, black and red, according to the substances that enter into their composition. The red sort is altogether unfit for the purposes of fuel; but the black sort is solid, and affords excellent fuel for domestic purposes. In digging bogs of the last-mentioned description, therefore, the soil taken out of the drains ought to be cut into turfs, and dried for use.

In proportion as the main canal advances, small ones may be cut into it on either side; the depth of the former must be regulated by circumstances; but the cross cuts should be, at least, four feet broad at the top, by three feet in depth. A whole year will be required to finish these drains; and in the succeeding spring it will be necessary to open and deepen them, and clear them from any matters that may have casually fallen in;—this work indeed should be occasionally renewed. During the second year, the main trench should be extended; fresh incisions may also be then formed by making fresh lateral cuts, and these may be drained by means of small cross drains. The advantage resulting from this mode of draining, which, though necessarily laborious and expensive, is very considerable; for, by the operation being thus gradually completed, the labour in succeeding years will be greatly reduced, in proportion as the bog subsides.

Where no fall can be procured, the water may, in many situations, be collected by cutting a long, horizontal ditch above the level of the marsh, so as to intercept all the wall springs; after which the water may be carried off in wooden troughs, or hollow bricks, above the surface; and
in case water should continue to penetrate the morass, it may be conducted to the extremity of the ground, either in open drains, or in covered brick drains, represented in the annexed figure,

![Diagram of a hollow brick](image)

which describes a hollow brick, two of which (one being placed upon the other) form a pipe, or tube, which is chiefly useful in making small drains.

![Diagram of hollow bricks](image)

DD are two bricks placed opposite each other, and then with a stone on the top, marked E, in which situation they will form a large drain; such bricks being kept firm and steady by the mould pressing on their sides. The turf taken off the soil should be laid upon the stone, with the sward or grassy side downwards.

In a former section, we have noticed the various implements that are employed for the purpose of draining land. In draining low lands, however, these ploughs may be advantageously superseded, in some cases, by the use of a cast-iron roller, or wheel. It weighs about four hundred weight, and is four feet in diameter. The cutting edge, or extreme circumference, of the wheel is half an inch thick; it increases in thickness towards the nave, or centre, and will cut a drain half an inch wide at the bottom, increasing gradually to the width of four inches at the top, and about fifteen inches deep. This wheel may be so placed in a
frame, that it may be loaded at pleasure, in order to penetrate to a greater or less depth, according to the resistance of the ground; which being thus cut in the winter, the tracks of the wheel may then be filled with twisted straw, and lightly covered over, or left to crack wider and deeper in the course of the following summer; when such clefts, or cracks, ought to be kept open with twisted straw, and covered over as above mentioned with light, porous earth. Hollow drains of this description are peculiarly calculated for grass lands, at a comparatively small expense, and will answer every useful purpose.

Sheep pastures may be drained of the superfluous surface-water, by means of a strong common plough, in the following simple manner. After turning up furrows through the hollow parts of the field, where the water is apt to stagnate, let a man pare off the loose soil with a spade, leaving the inverted soil, or grassy sod, about three inches thick; after which let him turn the sod over into the furrow, with the sward or grass side uppermost. Thus a canal of three or four inches will be left at the bottom of the furrow, sufficient to discharge a considerable quantity of water, which will readily subside into it.

It sometimes happens, however, that clayey soils are so loaded with water, that various drain-ploughs prove of little service, from the injury sustained by the soil from poaching by the feet of cattle. To supply this deficiency, and remove this inconvenience, it has been suggested by Mr. J. Middleton, to add a piece of wood to the felly of a common six-inch cart wheel, to which is prefixed a triangular rim of iron*, the cost of which simple addition will not exceed one guinea. A wheel of the description just mentioned, when put on the axle of a cart in the usual way, will consequently rest on the triangular iron rim; and on driving the horses forward, will, by its revolution,

* Middleton in "Commercial and Agricultural Mag." No. 22.
make a small indentation in the soil. In order to press it down to the depth of six or eight inches, the side of the cart next such wheel ought to be laden with iron, stones, or other heavy substances, until the rim and additional piece of wood (and likewise the felly, if necessary,) sink into the soil. The cart ought now to be drawn in such a direction that the cutting wheel may revolve where it is intended to form the drains. Mr. M. states that it will sometimes be requisite to draw such wheel through every furrow; though, in the case of level land, it should be drawn over the latter in parallel lines, five or ten yards distant from each other. Of course, the wheel on the opposite side of the axle, which likewise is a common six-inch wheel, will support only the empty side of the cart, and will not cut the ground.

In the draining of uplands, or those lands which are situated so high that the water can flow off from them, if it be properly collected and conducted, a different system prevails; of which, though our limits forbid us to specify every various situation possible, it is attempted to convey some idea in the following outline.

In lands of this description it generally happens that the waters from the springs beneath the soil are impeded in their current towards the rivers in their vicinity. The springs in question have been found to originate from the moisture of the surrounding atmosphere; which, being condensed into water on the summit of eminences, in consequence of the increased degree of cold prevailing in such situations, penetrates the various strata of the incumbent porous soil. The water thus formed continues to descend, sometimes for several successive miles, though in general from the nearest hills into the adjacent valley, till its course being intercepted by a bed of clay, it accumulates in considerable quantities; being thus forced to work its way through the porous strata of gravel, stones, rock, or sand,
incumbrant on the clay, it follows their course or dip till they approach the surface of the earth, or are impeded by any obstacle, which causes the water to rise upwards to the surface, and thus produces fens, bogs, springs, &c.

At the foot of eminences then, where too great a degree of moisture prevails, the ground should be perforated with an augre, in order to ascertain the depth of the latent springs, and of course the thickness of the upper bed or layer of soil. Should this not exceed four or six feet, a horizontal ditch ought to be cut along the foot of the hill, in order to intercept the water, which should be carried off by one or more trenches communicating with such horizontal ditch, and conducting the body of water, thus formed, into the nearest rivulet. And, as the strata or layers, through which the water penetrates in forming such springs, have in general the same inclination or dip as the surface of the eminence, the augre holes ought to be perforated, and the ditch cut perpendicularly to that surface, and not vertically downwards, as is usual in the common practice: by pursuing this mode, the arrival at the second stratum will be greatly facilitated, as the annexed figure will, we trust, render sufficiently plain.

In this figure, the letters a b represent the upper stratum, which may be supposed of marl; c d the second stratum, for instance, of sand; e f the earth accumulated in the valley. The letters g g illustrate the manner of boring
the holes perpendicularly to the side of the mountain, and not perpendicularly to the horizon, as at $h h$; from which it is obvious that, in penetrating the upper stratum in order to ascertain that beneath it, the former method $g g$ is much shorter, and consequently more effectual than the latter, $h h$.

Should it however happen, that, on cutting a ditch five or six feet deep, along the foot of a hill, vertically to the rising plain, the upper stratum be not cut or penetrated, and of course no water ooze into the bottom of such ditch, other holes must be perforated in the bed of the latter, to the depth of some yards, or till some water appear. In case this expedient succeeds, several holes ought to be bored, and the water thence arising should be conducted into the neighbouring brook, or rivulet; as it will now rise, collect in those ditches six feet below the wet surface of the valley, and thus be completely carried off.

In proportion as the ditches above mentioned descend, they should be made narrower by means of spades calculated for this purpose; the lowest part being contracted more than any other, not only because such narrow channel gives the water a more rapid current, but also in order that its shoulders or edges may support stones, or faggots, for covering the drain at a small expence, without affecting or impeding the current of water. Hollow bricks, ridge tiles, or fragments of plaistered floors, may be cheaply substituted for stones, pebbles, or faggots.

For draining a hill, composed of alternate beds of rocks and clay, it will be necessary to make different drains across, through the wet ground, and at different heights, to communicate with a drain from the upper wet ground. The removal of superfluous moisture from soils that are porous above and retentive below, may be effected by making a large drain in the most convenient place, and cleaning the furs well, to serve instead of smaller ones.
The system of draining uplands, above detailed, is that pursued by Mr. Elkington, whom the Board of Agriculture honoured with a liberal premium for communicating his discovery to the public; although the priority of such discovery is claimed by Dr. James Anderson, who is asserted to have published an account of it ten years before. From a consideration of the various circumstances, it will be seen that draining depends upon three points.—1. Upon finding the main spring, or cause of the injury the land sustains, without which nothing effectual can be done.—2. Upon taking the level of that spring, and ascertaining its subterranean bearings; for, if a drain be cut a yard below the line of the spring, the water thence issuing cannot be reached; but by ascertaining that line by means of levelling, the spring can be cut off effectually, and consequently the land will be drained in the cheapest and most complete manner.—3. By making use of the augre, to reach or tap the spring, and give vent to the water thus confined, when the depth of the drain does not reach it; where the level of the outlet will not admit of its being cut to that depth, and where the expence of cutting so deep would not only be very great, but the execution of it accompanied with very considerable difficulty.

Sometimes, however, situations occur, in which the first stratum of earth is too thick to be easily pierced by the augre; or, where the water, condensed in the manner already stated, may work its passage between the second, third, or fourth strata, forming the sides of the hills, from a deficiency of so many of their strata at the summits. Consequently the water, being confined by the substances which form the plain of the valley, ascends through them to the surface, and thereby forms marshes and bogs; this inconvenience may be successfully obviated, by adopting the common method of draining.

Lastly, when the drains have rendered the marshes suf-
ficiently firm to allow cattle to walk on them, the heaviest rollers that can be obtained should be drawn repeatedly over them during the first year, in order to consolidate them effectually. Previously to rolling in the spring, it has been recommended to sow every kind of grass-seeds indiscriminately on the land, such as clover, hay-seed, ray-grass, or darnel, &c.

In the course of the preceding details on draining uplands, frequent mention has been made of the augre, an effective implement for most common purposes; but as peat, when perforated with this instrument, is apt to close, by being pressed only in a lateral direction, without being cut, the current of water is liable to be again impeded, and consequently the work is rendered ineffectual. To obviate such inconveniences, a useful implement has been communicated to the public by Thomas Eccleston, esq*., of Scaresbrick Hall, in the county of Lancaster, of which the annexed figure will afford an idea.

A is the cutter of the peat borer, (for such is the name of Mr. E's contrivance), which penetrates the peat.

B, the body of the borer, which is six inches in diameter.

C represents the opening through which the peat, introduced by boring, is extracted from the ground.

D describes part of the iron bar of the peat borer, to the upper part of which a cross handle is to be attached.

By means of this machine, a cylindrical column of peat, six inches in diameter, will be effectually cut out and removed, and thus afford a free passage to the water. Thus

the trouble and expence of draining marshy land may be considerably reduced; and they will at length become so firm, that the first drains will continue uninjured. In his communication to the Society for the Encouragement of Arts, Mr. Eccleston states, that the situation of the soil must regulate the proper depth to which the peat-borer ought to descend. Where moss lands are very low, and liable to inundation, it will be proper to penetrate only sufficiently deep to drain the surface, as deep boring would cause it to sink so exceedingly low as to be overflowed by every sudden shower of rain.

Before the subject of draining be dismissed, it may not be altogether unnecessary to notice a fact relative to the obstructions to which drains are liable, either from stones or earth falling into them from the sides, but more particularly from the growth of the marsh horsetail (Equisetum palustre, L.), an aquatic vegetable, that has been discovered growing within drains to a very considerable extent, which it has at length completely choked up. For the following remarks on the effects produced by that plant on drains, we are indebted to a communication by Sir Joseph Banks to the Board of Agriculture.

At the late Duke of Bedford’s seat, at Woburn, Bedfordshire, some bogs, drained by under drains, made at a great expence, appeared at first perfectly dry; but have since been found to become less gradually so. On examination, these drains were found more or less choked by a plant vegetating within them, and forming both stems and roots, the whole several yards in length, intercepting the course of the water, weakening the current by degrees, and at last wholly choking up or obstructing the drain. This plant is the Equisetum palustre, a weed common in moorish and swampy ground, though little noticed by naturalists. Its root, or rather its stem, under ground, is a yard or upwards in length, and in size like a pack-thread; from this a root,
the size of the stem, runs horizontally in the ground, taking its origin from a lower root, which strikes perpendicularly downwards, and which Sir Joseph Banks says, he has been able to trace as thick as a small finger. This root forms, in some places, beds which occupy a large portion of the more solid spots of a peaty bog, as may be seen in some parts of the banks of the Duke's open drains. As the bud, by which the plant appears to renew itself in the spring, is situated on the horizontal root, a yard or more in depth, the shoot must, in its progress upwards, be liable to meet with under drains and penetrate into them, through the openings left for the passage of the water. When once entered, nature has given the plant powers of piercing the soil upwards, and to enable it to vegetate in the atmosphere of a drain. The evil, if known, Sir Joseph Banks thinks, may be removed by casting the under drains into open ones.

§ 2. Fallowing.

Fallowing is a mode of preparing land for the reception of grass seeds, grain, or other crops, by repeated ploughings for a considerable time before it is finally ploughed for seed. By this operation a variety of alterations is produced in the soil, which is ultimately rendered more mellow than could have been otherwise effected. The beneficial consequences resulting from fallowing are thus stated by Dr. Darwin ("Phytologia"):

—First, By repeatedly turning soils over, much fixed air; or carbonic acid, is produced in a fluid state, which becomes and continues united with the vegetable recrements, or with volatile alkali or calcareous earth.

—Secondly, The constituent parts of the soil become better incorporated, and thus reciprocally ameliorated, so that they will afford more uniform nutriment to the roots of plants.

—Thirdly, The pulverized soil may be more easily penetrated, and thus exposes a greater surface of its cavities to

* "Communications to the Board of Agriculture," vol. ii.
the vegetable absorbents.—Fourthly, all useless and noxious weeds and plants will thus be eradicated, or continually ploughed under the soil while they are young; so that a considerable quantity of vegetable nourishment will not only be reserved, but also increased, by the saccharine and mucilaginous matter of such young plants turned in by the plough.—Lastly, There are some plants which, during their herbaceous state, do not exhaust the land on which they grow before the seed stems arise; such, for instance, are turnips, when pulled up and carried off the land for feeding cattle elsewhere. This advantage is produced by the earth being shaded by the thick foliage of those vegetables, and of course ameliorated; because its nutritious properties cannot have suffered so much by evaporation as if the soil had been exposed to the scorching influence of the sun ("Phytologia," p. 283, &c.)

Lands are laid fallow, either in winter or during the summer season, according to the nature of the soil, and as the judgment of the farmer shall direct. There is, indeed, a great difference of opinion among experienced agriculturists as to the propriety or inutility of winter or summer fallowing. The benefits resulting from this practice, however, are obviously such as necessarily to lead to this inference, that winter and summer fallows are occasionally useful in different soils; and consequently the nature and qualities of such soils afford the best criterion for this purpose.

The late Dr. Darwin, adverting to this subject, has judiciously remarked, that though a summer fallow may be beneficial to a poor soil which has nothing to lose; yet it must prove injurious to a rich one, which has nothing to gain. Thus dry, gravelly soils may be well managed without fallowing; because (being chiefly in culture for turnips, potatoes, and similar herbaceous plants, above referred to,) they are preserved by repeated hoeing in a sufficiently mel-
low state, and kept thoroughly free from weeds without being liable to deterioration from too much exposure by fallowing. The same remark is likewise applicable to such dry, gravelly lands, the staple of which is enriched by the frequent spreading of manure. On the contrary, stiff clayey lands are best laid fallow in the summer; for, beside the prevention of poaching, (which, from their tenacity and stiffness, must necessarily take place in winter by the feet of cattle employed in ploughing them up), such lands are thus effectually broken up, and the various beneficial effects resulting from fallowing are obtained in their fullest extent, particularly in what respects the more vigorous growth of the vegetables sown or planted there; and also with regard to the destruction of the rank weeds that peculiarly infest lands of this description, and which can only be removed by frequent ploughing and harrowing during the summer. Perhaps a little time before midsummer, when weeds flourish with all the luxuriance of vegetation, would be most convenient for this purpose, if the farmer could conveniently perform the operation; as the increased flow of sap, which would necessarily ensue, would cause them to perish. We are however aware, that there are some weeds so little affected by the exposure consequent on fallowing, that they can only be effectually removed by manual labour, after the soil has been previously harrowed and rolled repeatedly. The weeds thus collected may afterwards be converted into a useful compost for manure, by an easy process, that will be mentioned in a subsequent page*.

After the first fallow, if the farmer pay due attention to the proper performance of that operation, a second will be unnecessary, as experience has shown, in well-cultivated places, that lands may be kept free from weeds by cultivating those crops to which the drill husbandry is applicable,

* Sect. III. of this chapter, on Manures.
so that the land may be frequently stirred around the roots, either by the hand or horse hoe.

A successful instance of summer fallowing, in clearing and reclaiming foul land, occurs in Mr. Marshall's interesting work on "The rural Economy of the West of England," vol. ii. In July, 1791, the land, then in a state of loose broken ground, was laid up into narrow ribs by a half ploughing, with a turn-wrest plough, with the stern set ten inches wide; forcing up the ridges as high and as sharp as possible, in order to destroy the root weeds by drought, and by breaking their field of pasturage; and also with a view to give the seeds of weeds an addition of air and surface, to promote their vegetation. Three weeks afterwards, the first ploughed part was harrowed across the ribs with long-tined harrows; leveling the surface completely, and following them with a roller, and finer harrows hung behind it; thus grinding down every clod, and effectually destroying every seedling weed that had vegetated.

A week after, the surface being thickly set with another crop of seedling weeds, Mr. Marshall turned them under by one deep ploughing across the former ribs, and in narrow pits, but with a broad share, and with a stern twelve inches wide; thus moving every particle of the soil about ten inches deep, leaving the surface rough and cloddy. Over this rough surface was spread a moderate dressing of yard dung, which was dragged, rolled, and harrowed till it was effectually incorporated with the fresh, raw soil, brought up with a view to meliorate it, and also to force the seeds of weeds which had accumulated there.

After the seeds of weeds had exhausted themselves, and the crude soil had received the influence of the atmosphere, the dressing was turned in with a mean depth, or somewhat shallow ploughing, and the surface suffered to remain in the rough state in which the plough left it during the winter. In the following spring, as soon as the clods had thrown out
their seedling weeds, and the weather permitted it, the surface was pulverized, to provoke the remainder to vegetation, and afterwards, at the proper season, sown with barley and and lay herbage.

The success answered the fullest expectation: the field thus managed being, in Mr. M's opinion, five pounds an acre better for it, reckoning on twenty years from the time of performing it.

In every case, Mr. M. observes, where circumstances will allow it, an eighteen-months' fallow should be broken up in autumn, or early in winter, by a rib ploughing, and be suffered to lie in an exposed state during the winter. This, besides employing the winter frosts in the great work of purification, accelerates the business of the ensuing summer, and renders the whole operation a matter of ease and convenience, and in the end complete: putting the soil in its most profitable state for several years. Under proper management, and with the assistance of fallow crops, lands thus effectually reclaimed may not require a repetition of the operation for half a century afterwards.

§ 3. Paring and Burning.

The paring of land is a practice of long standing in this island, particularly in the west of England, where it is also denominated (in conjunction with burning) den-shiring, burn-haunting, or sod-burning. It consists in cutting, or paring off, the turf or surface of the ground, and piling it in heaps to dry; which are afterwards kindled and burnt to ashes, that are spread over the surface and ploughed in. The best time for this purpose is, from the latter end of February, throughout March, if the north-east wind prevail, to the end of May. It is proper to employ several hands in the burning, at one time, in order that a dry season may be obtained, in case the season should in general prove wet. The ashes should be spread before the plough, and turned
in immediately. By breaking up old grass, or saintfoin lays, in this manner, Mr. Young observes, they are brought into order for turnips with only one ploughing; so that not only are much expense and tillage thus saved, but also the destructive turnip-fly never attacks turnip crops on burnt lands; a circumstance of no inconsiderable importance, especially as turnips are generally a crop that amply repays the expense of paring and burning.

This operation is performed on different soils with different implements. Thus, in old pastures, or meadows, the breast plough is an effective implement, its thighs being armed with wooden guards. From one inch to one inch and a half is the usual depth; though two inches depth is preferable, in the opinion of some agriculturists, on account of the greater quantity of ashes thus produced. It should, however, be observed, that the burning will be more certain, in case of unfavourable weather, the thinner the soil is pared. The expense of paring such land (including the burning of it and spreading the ashes) fluctuates from 1l. 5s. to 2l. per acre. In feney or boggy situations, for instance those in the county of Cambridge, a useful implement, denominated the paring plough, may be employed; it turns off a furrow from twelve to sixteen, and even eighteen, inches in breadth, and not exceeding one inch in depth. By using this instrument, the cost of paring, burning, and spreading the ashes is reduced to nine or ten shillings per acre; but it is calculated only for such soils as have been in a state of cultivation: for stiff lands Mr. Young has recommended a strong plough, in use on Lord Sheffield’s grounds, Sheffield Place; and which was originally brought from the county of Chester. The manner of piling the sods is likewise various in different districts; but, in general, it should be remarked, that the operation of burning will be most effectually performed by piling the parings into small cocks, or heaps, similar to those made in hay fields, placing the
grass sods downwards, for the admission of air, and leaving apertures both at the top and at the bottom of each heap; but these apertures should afterwards be closed up with fresh sods, in order that the burning may be properly completed.

There is, however, a difference of opinion on the propriety and impropriety of paring and burning land, among agriculturists. By some it is pronounced to be a wasteful, extravagant operation, which dissipates what should be retained, annihilates oils and mucilage, calcines salts, and reduces fertile organic matter into ashes of very weak efficacy; and that the vegetable particles which are brought into play at once for the production of a single crop might, by less desperate management, be husbanded to the support of many (Farm. Cal. p. 171). Such is the opinion of Messrs. Claridge, Kent, and Pearce, as well as of other eminent agriculturists; but their sentiments are strongly controverted by Mr. Young, and others equally experienced in the various departments of rural economy. By these advocates for paring and burning it is asserted, that the objections are not founded on sound reasoning and philosophical theory; that the most decided practice, and most extensive experience, pronounce this system to be an admirable one; and that the mischiefs and disadvantages, stated as thence resulting, are chiefly attributable to the abuse of the method, and by no means necessarily connected with it. With this last opinion we cordially coincide: for the vast crops of corn obtained from soils that have been pared and burnt, prove incontestibly that the soil is not deteriorated, and that the inconveniencies above detailed, as consequent on this system, are not rationally founded or supported.

The operation of paring and burning may be advantageously performed on heaths and downs, which have a thin, weak, and loamy sand, with a calcareous bottom; of such land considerable tracts have been broken up from a state of
nature, on Newmarket Heath, the expence 1l. 16s. per acre. Immense crops have been obtained, but from their very bad course, Mr. Young has observed, many enemies to this course of husbandry will arise, though most unjustly. Moory, fenny, and boggy or peaty soils derive very essential benefit from this practice, which is therefore adopted in almost every part of the kingdom. Adverting to this circumstance, in his interesting 'Agricultural Survey of the County of Suffolk,' Mr. Y. states that, without this capital assistant, the Suffolk farmers could not cultivate the land, it being scarcely possible to reclaim ground of this description without the aid of fire, which most effectually destroys spontaneous growth, and only fails when the labourers do not pare to a sufficient depth. Sand and chalk lands also are greatly improved by paring and burning; so likewise are loams, though some agricultural friends to this system have objected to employing it on such lands*.

Lastly, clayey soils may be advantageously pared and burnt; for not only does it add salts to the land, which the burning of grass roots produces, but also opens part of the stratum of clay next the soil so much, that the roots of vegetables can afterwards feed therein. One objection to this practice, however, ought not to be concealed, viz. that what is properly soil is thus converted into masses of infertile brick; for, the chief parts of the heaps are composed of ashes, properly so called, and though the remaining masses are of the description above noticed, yet these are so far from being a nuisance, that they tend to loosen and open the stubborn adhesion of stiff, tenacious clays, and thus form an excellent addition to the soil†.

Upon the whole, then, it appears that the paring and burning of land may be beneficially resorted to on most

* Farm. Cal. p. 177, where some interesting experiments, decisively in favour of paring and burning loams, are stated.
† Ibid. 176.
soils, provided it be conducted with caution; the ashes be spread as speedily and uniformly as possible over the surface, and especial care be taken not to exhaust it by repeated crops of wheat, and similar exhausting crops.

§ 4. Impediments to the Plough and Scythe.

In the preceding sections of this chapter the various modes of reclaiming land from a state of nature have been specified; there are, however, various obstructions or impediments that frequently prevent the soils from receiving all the benefit of which they are capable, and which will claim the notice of the industrious farmer. These it is attempted in the present section to state, together with the most approved mode of obviating or removing them.

I. Ant-hills are very detrimental to dry pastures, not only by wasting the extent of the soil which they occupy, but also by obstructing the free use of the scythe during the season of mowing. The common mode of removing them consists in dividing them into four parts from the top, and afterwards digging sufficiently deep, to take out the core below; so that when the turf is replaced, it may be somewhat lower than the level of the rest of the land. This will render the spot more moist or wet, and will prevent the ants from returning to their former haunts. In the counties of Herts and Somerset, there is a peculiar sort of spade appropriated to this purpose; the blade of which is extremely sharp, and is so contrived that its whole edge describes three-fourths of a circle. Several ploughs have likewise been invented, in different districts, for cutting off ant-hills level with the surface of the field: these implements, where they can be commanded, are of great utility, as they will perform the work of many men. But whatever method may be adopted for removing such obstructions, the work ought to be performed in November, or during some part of the winter; because, if the places or
spots be then left open and exposed, the frost and succeeding rains will exterminate all ants that may be in the lower part of their habitation.

II. Stones are either so firmly fixed in the soil that they cannot be removed without considerable difficulty; or, they are in a loose state on the surface of the soil after it has been turned by the plough. In the former case they are sometimes concealed below the surface of the land, and thereby greatly injure the implements; or, they are partly above and partly below the surface. In this case it has been recommended to blast, or blow them in pieces by the aid of gunpowder, the cost of which may be greatly reduced by mixing one pound of pulverized quicklime with the powder*; and, after the stones have been thus broken, they may be dug out and carried away.

Such stones, however, as are found in a loose state on the surface of the land, and are liable to impede the scythe, ought to be picked off, but only in a dry season, in the month of March; for, if too many stones be taken away, the land will receive very material injury, especially if it be thin or of a light staple; because they not only prevent the crop from being scorched up during summer, but also the exudations of the earth from evaporating. And in stiff, binding land they prevent its running together, and hardening like mortar in a wall, and consequently promote vegetation. The injury which soils are exposed to by picking off all the stones, has been clearly ascertained by the late Mr. Macro, an experienced agriculturist of Suffolk, who, suspecting that this practice on his turnip lands had produced

* Vide Griffiths, in "Letters and Papers of the Bath and West of England Society," vol. viii. where it is stated, that a mixture of lime and powder, in the proportions above noticed, produced an explosion with a force equal to three pounds of gunpowder; consequently, by the adoption of this suggestion, one-third of the expense will be saved.
more harm than benefit, tried an experiment in the spring, by picking off the stones of one square rod, after the turnips had been folded off, and laying them equally over another square rod by the side of it. He then sowed them with barley, marked them out, and at harvest time collected their produce separately, as well as that of another contiguous square rod, which had only the natural quantity of stones. The following was the result:

<table>
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<tr>
<th>Produce of the rod that had the double quantity of stones;</th>
<th>qts.</th>
<th>bits.</th>
<th>per acre</th>
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<tr>
<td>Ditto from that whence the stones were gathered,</td>
<td>6</td>
<td>8</td>
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<tr>
<td>Ditto from that in its natural state,</td>
<td>60</td>
<td>7</td>
<td>20</td>
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<tr>
<td></td>
<td>60</td>
<td>7</td>
<td>31</td>
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From this experiment, the result is evidently in favour of the largest quantity of stones; and Mr. M. is of opinion, that it is an erroneous practice, after sheep have trodden out a great quantity of stones in feeding off turnips, to have them raked up clean, as he has known some farmers do; because the rake cannot be used without taking some of the teathe, or dung, with them. On this experiment Mr. Young has observed, that its result coincides with various observations which have been made in several counties, particularly Hertfordshire, and also in France, and that the lesson it suggests deserves no slight attention.

III. Weeds.—Under this denomination is comprehended all those coarse, rank vegetables, which flourish spontaneously, to the great injury of other plants. They are either annual, i.e. last for one year only; or perennial, in which case they continue for several years. In the former case it will be most advisable to eradicate them by the plough before their seeds are formed; or, at all events, before they are ripe. With regard to perennial weeds, which are extremely difficult to extirpate, on account of the depth to which their roots strike, the common practice for destroy-
ing them is that of ploughing them up, and then collecting them by the hand. This method affords employment to numerous females and children; but, on account of the expense attending it, it has been suggested, by the late Dr. Darwin, we believe, to cut them half through about the middle of June, or when they are in full vigour; because the sudden interruption of the circulation of the sap produces a stagnation of the latter in the roots, and consequently the weeds perish. They may then be collected and burnt, and spread on the land by way of manure; or, perhaps more profitably, converted into a compost by the process which will be mentioned in a subsequent section (III) of this chapter.

IV. Wood.—With regard to timber trees, when they obstruct any of the operations of agriculture, it will be most advisable to eradicate them by means of the machines in use for that purpose, especial attention being given to clear away all their roots at the proper season of the year; and, with this view, Mr. Bentinck's contrivance for pulling up trees by the roots may, where the farmer can command it, be beneficially employed: its price, we understand, is one hundred pounds. In the case of shrubs, such as furze, or whins, it is no unusual practice to set fire to these, and afterwards to grub them up; by which means much loss is sustained, not only from the valuable manure thus lost in the furze, but also by the loss of a valuable article of food for cattle, which (as already intimated, p. 101) will eat the tops, or shoots, of that shrub with avidity, when bruised for that purpose.

After furze, or any other shrub that forms an obstruction, has been grubbed up, it has been recommended by an able agriculturist, (Mr. Headrick, in “Communications to the Board of Agriculture,” vol. ii.), to admit sheep to pasture, which would effectually prevent such shrubs from growing again from the small roots left in the ground. But
he thinks this experiment would be attended with yet greater success, if the land were thoroughly fallowed, and every root removed as soon as it appeared. After which the soil, being well manured with lime and undergoing a course of crops, might be sown with grass-seeds alone; and, as soon as sheep could be admitted with safety, he would turn them in, as they would probably destroy the tender shoot of every plant as soon as it rose to the surface, and consequently keep the ground perfectly clear in future.

§ 5. Ploughing.

Ploughing is one of the most important operations in agriculture, and ought to be executed with the greatest attention; hence every husbandman should see that it be well performed, as otherwise he may be irreparably injured by bad ploughmen. In regard to the times and seasons for ploughing, it may in general be remarked, that the latter part of autumn or commencement of winter is best calculated for most soils; because they are thus rendered capable of receiving a considerable degree of moisture for the ensuing summer; whereas, if land be turned by the plough in the spring and summer seasons, it invariably suffers much loss by the evaporation of its moisture. No marshy, stiff, or tenacious soil, however, ought to be ploughed while in a wet state; for the labour is thereby not only increased unnecessarily, but also the soil cannot thus receive any material improvement.

Concerning the depth and frequency of ploughing, agriculturists are by no means agreed; in fact, these points must necessarily be regulated by the nature and quality of the vegetables intended to be raised, and also by the nature and properties of land. And as, in a work of this nature, it is impossible to state or discuss every possible situation and circumstance connected with the subject of ploughing, we shall subjoin a few hints on this subject, on the authority
of Mr. Young (Farm. Cal. p. 509), an attendance to which will not be without some use to the young farmer.

1. "An additional depth should first be gained in autumn, that successive change of seasons may take effect in atmospheric influences, before any seed is ventured in the raw stratum first brought up.

2. "The quality of that stratum should be examined; it is sometimes steril, by reason of an acid discoverable by boiling in water, and putting that water to the test of blue infusions.

3. "Animal and vegetable manures cannot be buried; at whatever depth they are deposited, their constant tendency is to rise to the atmosphere.

4. "Fossil manures are extremely liable to be buried, having a constant tendency downwards. Chalk, marl, and clay are sufficiently soluble, or so miscible with water as to sink in a regular mass, and are sometimes found much below the path of the plough.

5. "In soils of a poor, hungry quality, there should be some proportion observed between the depth of ploughing and the quantity of manure usually spread; but this does not hold good upon better soils.

6. "Soils are rarely found that ought not to be ploughed, in common, six inches deep; many ought to be stirred eight inches, and some ten.

7. "One deep ploughing (to the full depth) should be given once in twelve, eighteen, or twenty-four months; if this be secured, shallow tillage, by scaling, scarifying, scuffling, skimming, or broad-shaving, is in many cases preferable to deep working oftener, and especially for wheat, which loves a firm bottom."

In addition to these hints we have only to observe, that the various preparatory ploughings ought, in most cases, to be deeper than those intended to be immediately followed by seed; in which last case they should be slight, and the
PLIT, or plough-slice, ought not to be laid over too much, in order that the seed may be perfectly covered. Farther, lands that have been recently manured with lime or marl do not require deep ploughing; on exhausted soils, however, it is very beneficial, and on that account is generally recommended by the most experienced agriculturists.

The advantages derived from the use of the plough are very great; the soil being opened for the reception of vegetable aliment from the air, the food of vegetables is consequently increased; and, the surface being thus enlarged, a larger portion of ground is exposed to the influence of the air. By rendering light lands firm, and breaking up such as are too solid, ploughing essentially contributes to ameliorate the earth, and extirpates noxious weeds, by exposing their roots to drought, so that they necessarily perish. And lastly, by forming the land into ridges, it tends to remove humidity, as the surface-water may discharge itself into the furrows, and be conducted thence by means of drains, or ditches, into some stream. Much attention, however, is necessary in forming ridges: if the soil be deep, these ought to be narrow; in more shallow situations they should be made broader; where there is a considerable declivity, they should be formed with a gentle slope, in a direction due north and south, in order that they may gradually carry off the water. And as the best and most fertile mould is collected in the tops or crowns, it will be necessary to manure the sides of the ridges, which would otherwise yield but indifferent crops. Consequently the ground will become nearly of equal fertility, so long as the ameliorating properties of the manure continue.

§ 6. Harrowing.—Rolling.

After the land has been broken up, the aid of the harrow becomes necessary, in order to pulverize the soil more effectually, as well as to eradicate weeds from the soil, and
also for covering in the seed, after it has been committed to the earth. According to the nature of the soil, and the peculiar purpose for which this operation is required, the size of the harrows, scarifiers, or scufflers employed, necessarily varies. Hence, as we have already noticed (chap. V. p. 259.), the most effective harrows in modern use, we shall only observe with regard to strong lands, that though they require more harrowing than lighter soils, in order to pulverize them, yet as all soils become more firm and solid by harrowing, the less strong lands are harrowed, if the intention be answered, the better. Such lands should also be harrowed during dry weather only, as the ground will become poached, and consequently more retentive of moisture. Light, spongy soils, on the contrary, particularly such as contain any portion of peat, being rendered more compact and retentive by this operation, can scarcely be harrowed too much; but this should by no means be done during exceedingly hot and dry weather, because too large a portion of moisture will evaporate.

The mode or manner of harrowing depends on the nature of the seed sown and other circumstances. For grass seeds this operation should be performed very slightly, with a light implement, having short teeth, otherwise the seed may be put in too deep, and consequently will not vegetate. Where a field has been indifferently ploughed, and the ridges are raised in the middle, the harrow should pass first along such ridges, then across, and afterwards along them again; without this precaution, much seed would fall into the bottoms of the furrows, and would not vegetate. On the other hand, well ploughed lands, the ridges of which are nearly level, may be harrowed either in the way above mentioned, or first across, and then along the ridges, as may suit the farmer's convenience.

Rolling is an operation of equal importance with harrowing, in reducing and pulverizing strong, heavy, and
adhesive lands; while, by rendering loose soils more compact, the earth adheres more closely to the roots of plants, and thus promotes their growth. The season varies according to the nature of the soil. Thus, light lands may be indifferently rolled at any time after harrowing; but, on retentive and stiff soils, the roller can only be beneficially used when they are in a pretty dry state, because, during damp or wet weather, they would be greatly injured by the poaching of the team. Whereas, if the roller be employed on such soils in the intervals between the different harrowings, all lumps and clods that may lie on the surface will be effectually broken to pieces and pulverized, for the reception of seed. Lastly, the roller is of eminent use in the management of grass lands, over which it may be beneficially passed once early in the spring, a second, and if it be practicable a third time after irrigation; because the earth will not only be thus rendered more firm around the roots, but a uniformly smooth surface being obtained, such treatment will also greatly facilitate the future mowing.

§ 7. Irrigation.

Though water is very injurious to land when it soaks into or stagnates upon it, yet it makes a very great improvement upon land that is flooded with it, where there is plenty of running water that can be conveyed upon the land, and drawn off thence at pleasure. Thus, suppose there is a piece of ground lying contiguous to, and somewhat lower than the river; some water being conveyed from the river to the higher parts of the land, will show where a carrier is to be cut, for conducting the water from the river to such higher places. These carriers, or carriages, as they are respectively termed, being filled till they run over throughout their whole length, drains are to be made in the lowest parts of the meadow, as nearly parallel to the carriages as possible. The design of these drains is
to discharge the water into a large or main drain, which conveys it off the meadow.

In order to make the water run equally over the sides of the carriage, there are stops made in it at proper distances, by which the course of the water being obstructed, it rises a little and runs over the sides of the carriage. These stops are made with pieces of turf laid across the carriage, as high as the banks of it, next the sides, and lower towards the middle of it; which stops being of a proper height and distance from each other, (such height and distance to be determined by trials), the water will uniformly flow over all parts of the banks of the carriage.

These carriages should be made with a small ascent in the bottoms of them, from the river to the further end, and should all unite near the river, where a sluice is to be placed with gates or hatches; which being shut, to keep back the water coming from the river, and a small sluice in the side communicating with the main drain of the canal, opened at the same time, the water in all the carriages or canals will then return from the further end of the carriages, and, passing through this small sluice into the main drain, the carriages will thus in a short time be laid perfectly dry. The bottoms of the drains are, on the contrary, to be made highest next the river, and from thence deepening to a large drain at the lower end of the meadow; so that when the water ceases to run into them over the sides of the carriage, they will soon be emptied into the main drain, and thus the whole meadow will be laid dry.

When the meadow is to be watered again, the small sluice is to be shut and the large one opened, which will admit the water from the river, and irrigate the meadow as before. The water should flow over the sides of the carriages, and over all the surface of the land lying between them and the drains, as equally as possible; and for this purpose, the earth dug out of the drains and carriages at
first, and afterwards when they are scowered or cleansed, is to be laid upon the lower part of the ground, so that it may lie even and upon a regular descent to the carriages or drains. The soil thus dug or scowered out, also serves to repair the banks of the carriages.

Though the water flows equally over the surface of a water meadow, the grass does not grow equally; but the crop is greatest towards the carriages, more of the rich sediment being deposited there than towards the drains; hence it is that the produce is greater where the carriages and drains are near together. The more numerous these are, the larger will the crops be, provided a sufficient proportion of water can be obtained.

The constructing of sluices is one of the principal articles of expence, partly because they are usually made of timber, a material which is subject to decay in the compass of a few years, whereas brick and stone, cemented with tarras, are equally proper and infinitely more durable; particularly when the sluices are constructed upon correct principles, so as to prevent them from being blown up, or the water from forcing a passage at the bottom; a circumstance which, when it happens, often renders it necessary to rebuild the sluices. It would be foreign to the plan and design of this work to detail the mode of constructing the sluices, stops, &c. necessary in the system of flooding land; we therefore at present observe, that the different works ought to be carefully examined and scowered out in autumn, and all necessary repairs made, and refer the reader to Mr. Boswell's very interesting "Treatise on watering Meadows," (8vo. 4th Ed. 1801).

The preceding hints have been given on the supposition that the land is perfectly level; but where its surface is very uneven, the inequalities should be removed, though the expense be considerable, as the improvement will more than counterbalance the expense. A striking illustration
of this remark occurred some years since in a small, coarse meadow, which consisted chiefly of a peat soil, and out of which the peat had in some places been dug one or two feet deep, in others six or seven feet, and in some places not dug at all. Thus it remained for some years in pits, very irregular, and for the most part inundated with water, being contiguous to a river. In order to reclaim this unprofitable spot, the spirited proprietor first cut a large drain, in order to carry off the water, and then leveled the ground, laying it in straight, low ridges, about nine yards in breadth. Carriages were made on the tops of these ridges, and from thence to the furrows or drains; between the ridges the ground was laid upon a descent, about one inch to a yard; drains were also made in the furrows parallel to the carriages. A cut was then made from the river to let the water into the carriages through a sluice made in the cut; and a small one in the side of it, to let the water out of the drains, when the meadow was to be laid dry.

In performing this work, the greatest attention and accuracy were necessary, and were given; because the dip of the river was low, and the water often did not rise sufficiently high to fill the carriages; and, therefore, he could not raise the ridges to such a height, and give them so great a descent, as he could have wished. For, it should be observed, where it can be had, the descent should be greater than here, in order that the water may flow quickly over the sides of the ridges; and, as then more water is required to be thrown over them, a large portion of fertilizing sediment is deposited upon the meadow, and the water has not time to soak into it to such a depth as it otherwise would; and thus the land is prevented from becoming chilled, and the herbage from proving to be coarse and rank.

The proprietor of the meadow in question not having
enough of the turfy staple to lay upon the ridges all over the meadow; he was reduced to the necessity of laying on it promiscuously such earth as came to hand; and, as much time would thus necessarily have elapsed before a good turf could be formed, and a good crop produced, he, therefore sowed it with hay-seed. He then let the water on and off gradually, till the works were settled; the earth and mud scowered out was laid upon the low parts of the banks and the surface of the meadow.

As the supply of water was often inadequate, so, that it could not be thrown over the whole meadow at once, he was under the necessity of watering it in divisions; having for this purpose made dams in the carriages, in proper places, so that he could turn the water on them at pleasure. This practice is worthy of notice, and deserves to be followed; for where it may not be convenient on farms to have three or four meadows to which the system of irrigation can be applied, yet it will be found very advantageous to divide one large meadow into three or more pans, or parts; for, as Mr. Boswell has justly remarked, while cattle are eating the first, the second will be growing, the third draining, and the fourth under water.

To return: notwithstanding all these inconveniences, the meadow in question produced, the third year after it was watered, one ton and a half of hay per acre at the first cutting, and was annually improving; whereas, before that time, it was scarcely worth as 6d. per acre. The expence was about 5l. per acre, the soil being very easily dug, especially where it lay under water; and, as the improvement thus effected was very great, we trust the annexed plan will, together with its accompanying explanation, convey a more clear and intelligible idea of it than could be given by a mere verbal description.
Fig. 1.—w, c, c, w, a, a, is the meadow, highest at c c; whence it has a small gradual descent towards a a.

The whole meadow is divided into ridges, about nine yards broad each, which slope from the crown about thirteen inches towards the lower sides, or about one inch to every foot in breadth.

C C C is the main carriage, which (when the meadow is to be flooded) is filled with water from the river R R, through a sluice at S.—c a, c a, are carriages which communicate with the main carriage at the upper side of the meadow, whence they are also filled with water; which, running over the sides throughout their whole length, flows over the grass, and then falling into the drains on each
side, d r, d r, is conveyed into the drain, r r, and from thence out of the meadow at n.

All the carriages of water-meadows should be broad enough to contain a sufficient quantity of water to flow over the whole surface of the land, and as quick as the supply from the river will permit. To make the carriages deep, would be of no use, because it is only the water at the surface that flows over the sides of the carriages. A carriage kept full, that has only six inches of water, will throw as much over upon the meadow as if the water in it were six feet deep. But besides, there is a damage in deep carriages, a larger body of water does by its weight force deeper into the ridges, which chills the land, and makes it produce flags and other aquatic weeds, to the great injury of the hay.

The drains d r, d r, are made between the ridges in the furrows, and parallel to the carriages: they are eighteen inches wide, and of a similar depth at the upper ends d d, and twenty-four inches wide, and the same depth at their lower ends r r.

The carriages, c a, c a, are widest (twenty-four inches) at their upper ends c c, to receive a sufficient quantity of water, and are gradually contracted from twenty-four to eighteen inches at their lower ends a a; by which contraction, the water being more and more confined, it rises a little, runs over the banks, and flows upon the grass on each side.

The drains, on the contrary, being made narrow at their upper ends, and widening, and also deeper towards the lower, they are on that account capable of receiving the accumulating water from the carriages, which they discharge into the large drain r r, to be conveyed out of the meadow at n.

The main drain, m n, is four feet wide, and is made to receive the water out of the carriages, through a small
sluice at O, which is to be opened for that purpose, when the meadow has been sufficiently watered.

If the bottoms of the carriages were level from one end to the other, the water could not be drawn out of them, but would stagnate there, and chill the ground, and make it produce sedge, flags, and such coarse aquatic plants; for which reason the carriages are deeper towards their upper ends next the river, by six inches, than at their further ends, a a. So that when the meadow has at any time been sufficiently watered, and is to be laid dry, by shutting the sluice at S, to prevent more water coming in from the river, and opening the sluice at O, the water begins immediately to run out of the carriages into the main drains, and are all emptied in a short time; and the water in the drains running off at the same time, the whole meadow is soon laid dry.

It is not necessary to continue the carriages so far as the drain r r, but may be made shorter by three or four yards: for the water that runs over at the ends of the carriages will spread, and flow over the intermediate spaces, from a a to the drain r r.

Where the water does not run over the sides of the carriages, or not equally, stops are, as before observed, to be put into the carriage a little below, which will make the water rise a little above the stops, and flow over the bank. These stops are made with pieces of turf laid across the carriage, by way of a dam. The turfs are to be laid higher than the surface of the water next the banks of the carriage, but a little lower in the middle for the water to pass there: in this form [V-].

The sluice S, by which this meadow is watered, is two feet wide, and three feet nine inches deep. While the meadow is watering, the hatch or gate of the sluice is drawn up about two feet and a half, and then the water passes through an aperture of five square feet; which, sup-
posing it runs at the rate of two feet in a second, the quantity of water thrown upon this meadow is ten cubic feet in a second, or above 560 tons an hour. A much larger quantity would be more beneficial; though a less supply would make a considerable improvement.

Fig. 2.—d, c, d, is a section of one of the ridges. C the carriage on the top of the ridge, and d d the drains into which the water falls, after it has flowed over the land on each side from c to d.

If there is not sufficient water to irrigate the whole meadow at once, it may be done in two or more divisions. As, suppose the part w, c, m, p, or about half of it, is to be watered first; make a dam across the main carriage at c, p, and then the part w, o, p, may be watered in the manner as already described: and the other part will remain dry. And, in order to water this other part by itself, make a dam across the main carriage at o m, and at the upper ends of the other carriages from o to p; the water, being then let in from the river, will fill the other carriages, and flow over this part of the meadow only.

These dams across some of the carriages do very well occasionally; but where there is not a sufficiency of water, and a meadow must always be watered in divisions, it is the best way to put in small sluices in convenient places of the carriages, to turn the water on and off the several divisions of the meadow at pleasure.

When the water has flowed over a meadow, and is all discharged; if there are any other meadows situated below n, they may also be flooded in the same manner as the first, and with the same water: and though the improvement of the lower meadows will not be so great as of the uppermost or first meadow, it will be considerable, and very well answer the expence and trouble of watering them: and in some places the water is thus thrown over several meadows in succession, for some miles.
Any meadows contiguous to a river may be watered, though not laid out in such an accurate manner as in this example. For if the river is a little higher than any part of such meadows, main carriages may be made, and the water conducted to the highest parts, and other carriages made branching from them, and between these the drains; which, though they cannot be cut quite parallel to the carriages, on account of the unevenness and irregularity of the ground, they will, notwithstanding, very well answer the purpose, to a great improvement; care being taken not to place the carriages, nor drains, too far asunder. The nearer they are together, so as there is room left to mow between them, the greater will be the improvement. Where there are any hollows, they should be filled, and the surface laid smooth, with the earth dug out of the drains, that the grass may be mowed very close.

There is another description of irrigation, practised in the county of Gloucester, where it is termed catch-work. It is calculated for meadow and pasture lands, which lie on a steep declivity, or on the side of a hill. This method is denominated catch; because, when the whole is watered at once, the water, by the main cut or feeder, having attained the top of the piece of ground, floats over the uppermost pieces (in the language of irrigators, pitches, or panes,) and is caught in (i.e. falls into) the floating gutters which distribute the water from one pitch to another, till at length the water reaches the bottom of the field, where it is received into a drain for the purpose of carrying it off, or conveying it to other lands situated on lower levels. In this method of watering, fewer cuts are necessary than in the mode of floating above detailed; and these are made as nearly in parallel lines below each other as the bank will permit.
In this delineation of a catch-meadow (selected from Mr. Wright's valuable "Art of floating Land," 8vo. 2d Ed.) the lateral, horizontal, feeding gutters, which distribute the water over the first and second pitches, are represented as shut by sods or stones (8), consequently they appear dry. The whole body of water is represented as passing down the main feeder into the lowest floating gutter, whence it floats the lowest or third pitch, and is received into the drain at the bottom of the meadow, to be returned by it into the natural channel.

When the whole is to be floated at once, the obstructions (8) are taken from the lateral floating gutters, other obstructions being in the mean time placed in the main feeder, immediately under the floating gutters, in order to force the water into such gutters. But, in obstructing the main cut or feeder, care must be taken not to stop it entirely; but part of the water it contains should always be allowed to escape in it to the lower panes, or pitches; for, supposing the main feeder to be entirely shut under the feeding gutter (g 1), so that the whole is made to run over the first pitch from such gutter and the horizontal part of the main drain, the water, filtrated through the grass of the first pitch, would be so much divested of its fertilizing
qualities, as to be almost incapable of communicating any perceptible benefit to the pitches lying beneath. Water thus filtrated is, in the language of Gloucestershire irrigators, termed *used water*, and is regarded as next to *useless*; and hence it is, that the grass growing nearest to the floating gutters is most abundant, and of the best quality, in all kinds of meadows.

The proper breadth of the panes or pitches of catch-meadow, from gutter to gutter, is by no means correctly determined; but it should seem, that they ought not to be much broader than the distance from the floating gutter to the receiving drain in *float-meadows*, that is, from four to six yards. *Catch-meadow* is not held in such estimation, or so profitable, as *float-meadow*.

As, however, the expence attendant on the system of irrigation is necessarily very considerable, the young farmer should, in the first instance, calculate the obstacles he is likely to meet with in the progress of his work, either from the stream, of which he designs to avail himself, not being his property, or jointly his and another's; from his being prevented using it by the circumstance of intervening land belonging to others, of whom he must purchase a right to make a cut or feeder; or from water-mills, &c. Having obviated these inconveniences, his next step should be to take a level, by means of a spirit or water level, from the highest spot where the stream enters his property, following the dead level, and at every three or four hundred yards staking it out doubly, one stake on the dead level and another near it, descending so many inches as an allowance to give the water a current. Two inches in a mile will move it; though from twelve to twenty should be allowed, in order that the current may be sufficient. Should roads intervene, Mr. Young suggests, that they may be passed by the Italian method, which is to form a work of masonry to act as a syphon; the water is made to
descend perpendicularly on one side of the road, in a brick or stone tunnel, to pass in an arch under the bed of the road, and rise on the other side in a similar tunnel, whence it passes on its course. But if the level be interrupted by farm-houses, gardens, cottages, &c. a much greater descent, per mile, must be allowed, in order that such interruptions may be gradually provided for*. Having ascertained these points, he will commence in such place as his judgment leads him to think best calculated for that purpose.

All lands that lie low, and are contiguous to the banks of rivulets, brooks, and springs, are capable of being watered, particularly where the water-course is higher than the lands, and kept within its bounds by the banks; and if the current have a very quick descent, the improvement by irrigation will be very great, attended with a comparatively small expense; because, in proportion to the greatness of the descent, the improvement is more speedy. But the lands most suitable for this purpose are, in Mr. Boswell's opinion, 1. a Gravelly, or sound, warm, firm, sandy soil; or, which is more frequently the case, a mixture of each, or almost any soil partaking of these qualities. Such soils, where there is a descent from the river, make an almost instantaneous improvement.—2. Boggy, miry, and rushy soils, which always occur near the banks of rivers, where the land lies pretty level, are capable of equal improvement with the other, when their respective values in an unreclaimed state are considered. In that state, indeed, swampy marsh-land is of little worth; but, by being judiciously watered and drained, it may be made to produce an ample crop of hay. More expense and judgment, he observes, are necessary to bring this sort of land into cultivation; which also, when very boggy, requires more and longer

* Farm. Cal. p. 301, where there are very many practical hints on this subject, which our limits will not permit us to notice.
watering than any sand or gravelly soils. The larger, however, the body of water is, that can be brought upon them, the more beneficial will be the consequences, as its weight and strength will greatly assist in compressing the soil and destroying the roots of the aquatic weeds growing upon it. An instance of the benefit resulting from this practice, in soils of the above-mentioned description, has been communicated to the public by Mr. Turner, of Bognor, in Sussex. Having about six acres of peat ground, through the middle of which there is a stream, especially in winter, he ordered it to be cleaned, and what came out to be cast on one side only, that he might turn and keep the water over one half of the bog. He had then no other object in view but to keep the old ditch dry, for the more conveniently digging of the peat on the lower side of the bog; the water was thus continued for nearly two years, when part of the mound gave way, and, not having occasion to dig any more peat, the water resumed its natural course. The side where the water had run became a very tolerable meadow, the moss, rushes, and other aquatic vegetables being nearly gone; and it affords such forward pasture, that he reckoned one year’s grass to be worth more than it yielded for seven-years before it was flooded,—3. Strong, wet, and cold clay soils are the most difficult to be improved by irrigation, not only from the dead level of their situation, but also from their tenacity, which will not admit of being drained without great expense and attention. But when this can be effected, and a strong body of water can be thrown over them from a fertilizing river, in the winter, and a warm spring succeeds, Mr. Boswell states, that the crops of grass upon such lands are immense*.

* Boswell on watering Meadows.

In addition to these remarks, it may be observed, that springy land is by no means fit to be watered, until it is rendered firm and compact by a thorough draining; be-
cause, if it be springy and wet, the water thrown upon it will soak into it, and cause it to produce at best only a coarse and rank herbage. There is no doubt, however, but that the system of irrigation may be applied, in many cases, with most promising prospects of advantage to mountainous moors; yet there are no tracts, perhaps, so much neglected as these. At this unaccountable neglect Mr. Young has justly expressed his surprise, because there are scarcely any situations that do not contain such spontaneous proofs of the benefit, "as," to use his own expression, "might have been sufficient for a hint to the stupidest clown." The firm spots by the sides of the torrents, from flooding, acquire a beautiful verdure, that proves a perfect contrast to the weariness of the surrounding waste; and where there are small rills on the mountain sides, which have not sufficient strength to work out a regular bed for their waters, but which spread, they are universally attended with a verdure (from the grasses subduing the heath, owing simply to the water,) which shows the advantage in the clearest manner. And he states, that he is confident that, with a little attention, out of twenty or thirty thousand acres of such land, which he has seen, in the sister island, water might be thrown over three parts in four.

The principle recommended by Mr. Young, in order to effectuate this desirable improvement, is to throw over the sides of the mountainous tracts as much water, and with as much equality, as possible; carefully preventing that fluid from remaining in spots, and securing his works from being blown up by sudden floods and heavy, impetuous rains.

The proper place for commencing this important work is, where there is a gentle declivity; then ascending as high as the water may be conveniently commanded, a stone wear must be made across a torrent, just sufficiently high to form a little basin among the rocks, if none occur exa-
cuted by the hand of nature. From the spot where such a basin is found or made, a trench is next to be opened, the course of which will be directed by the spirit level; care being taken to give it only the necessary degree of fall for bringing the water in a very gentle current. The stream is to be made to overflow out of this carrier trench all the way it runs; the trench must be made gradually smaller to the end, as the body of water it brings lessens in proportion as it advances. Here Mr. Young recommends the undertaker to pause for one or two years, to see the effect of his labour, without increasing the evidently trifling expense described; and, if he find that effect to be great, as he probably will, he then advises all the spaces over which the water is thrown to be levelled to that exactness which is necessary for mowing ground; the water is next to be let gently over, when the ground will soon be covered with grasses and other beneficial plants, to the gradual but certain destruction of heath, and similar pernicious vegetables.

There is great difference in the quality of water, arising from the various particles of matter that are mixed with it. Those rivers, which have a long course through good land, are impregnated with fine particles that are highly fertilizing to the adjacent meadows, which are casually overflowed by them, especially during floods, when the water is full of a rich sediment; for, though river water, when clear, may, by constructing wears at a considerable expense, be raised sufficiently high to overflow the contiguous lands, and be of service to them; yet the improvement thus effected is, by no means, equal to that obtained from the same water when it is thick and muddy. Hence it has been suggested, that material advantage may be derived from raising the mud in rivers at any time, and carrying it in the current of the water upon such contiguous lands as are sufficiently low to be overflowed. Where water runs
slowly, it deposits a considerable quantity of fine sediment, which may be raised by harrowing the bottom with common harrows, or strong thick bushes, loaded, and drawn by horses along the banks of the river. Cases have occurred, where lands have been thus improved, which were situated far below the level of the mud, at a small expense; where there were carriages or carriers, made before, in order to distribute such thick water uniformly over the surface. The expedient above suggested has, indeed, long been practised in Lombardy, where a kind of heavy harrow is drawn along the bottom of the main carriers, for the purpose of disturbing the mud in autumnal, winter, and early spring irrigations; and the practice of throwing lime into the water has been successfully adopted in this country, the great divisibility of that fossil in water being well known.

The water running through poor soils is a very indifferent improver of land; and, if impregnated with mineral particles, (particularly of a ferruginous nature), it is destructive to most kinds of plants. Hence it will in no case be advisable to attempt a large improvement by irrigation, until the quality of the water be known; and this, in most instances, may be discovered by observing the effect it produces upon the herbage of the land which is sometimes inundated by it; and may be easily ascertained by watering a small piece of land with it, by way of experiment.

Rivulets and brooks, however, are (in Mr. Boswell's judgment) the streams that can be used to the greatest advantage; because the expence of erecting wears across them will not be great, neither do any of those objections exist to which large rivers are liable. Besides, if they flow through a cultivated country, the land floods, occasioned by violent rains, bring a very large quantity of manure, such as chalk-water, sheep's dung, and the straining of arable
fields, as well as the scowering of roads and ditches, the runnings of farm-yards, the drains and sinks from towns and villages, all of which are carried by the rains into smaller currents, and thence into the larger streams, where (if there are no watered meadows) they are totally lost to the farmer. Springs may likewise be beneficially employed on the coarse lands contiguous to them, if a sufficient quantity of water can be procured to flood such lands. The springs in question are the heads of brooks and rivulets rising out of a chalky or gravelly, sound and firm soil, in a cultivated part of the country, and not those which rise out of poor, heathy, or boggy lands; for the water issuing from the latter is, in general, so small in quantity, always so very lean and hungry in quality, and often of an acid nature destructive of vegetation, that little if any advantage can be derived from them. But the former springs are invaluable; and every advantage possible ought to be taken to improve the lands lying near them. Of the beneficial effects produced by the springs first mentioned, Mr. Boswell gives a striking instance in a particular meadow that is watered by such springs, without any advantage from great towns, being situated only at a small distance below the head of the rivulet, which is supplied all the way by springs rising out of its bed as clear as crystal. The soil of the meadow in question is a good loam, several inches in depth, upon a fine springy gravel; and, whatever be the real cause, the fecundity of this water, he states, is beyond conception; for, when the meadow is properly watered and well drained, in a warm spring, the grass has frequently been cut for hay within five weeks from the time the stock was taken out of it, having eaten it bare to the earth. Almost every year it is cut in six weeks, and the produce varies from one to three waggon loads on an acre.

* Boswell on watering Meadows, p. 8.
In lands thus situated, in the mornings and evenings in the months of April, May, and June, the whole meadow will appear like a large furnace, so considerable is the steam or vapour, which arises from the warmth of the springs acted upon by the sun-beams; and, notwithstanding the water is so uncommonly clear, yet, on being thrown over the land only for a few days during warm weather, by dribbling through the grass, so thick a scum will arise, and adhere to the blades of grass, as will be equal to a considerable quantity of manure spread over the soil, and (it may be fairly presumed from its effects) still more ameliorating. It should, however, be observed, that this scum must not be suffered to harden to a consistency like leather; which it will do, if the water be allowed to remain too long in the land, especially in warm weather.

Farther, land floods may be successfully applied to the important purpose of watering pasture lands; they will, indeed, be always found of great use where the sweepings of towns, farm-yards, &c. are carried down by them; and it rarely happens that any other erection is required, excepting a sluice, or small weir, to divert and convey them over the lands. Should the soil, however, be situated on the declivity of a hill, catch-drains often become necessary in order to water the lower part of the hill, after the water has been floated over the upper part. In many parts of this island, where there are large hills, or extensive rising lands, great quantities of water run from them into the valleys, after heavy or long-continued rains; these might, with proper attention, be collected together before they reach the bottom or flat ground, and thence be diverted to the purpose of irrigating the subjacent lands with great advantage to the occupier, and at the same time at a trifling expense. Should the land thus situated be arable, it may be beneficially converted into pasture, especially if ground.

* Boswell, p. 10, 11.
of this description be a desirable object to the land-owner. The following method of employing land floods, for this object, is recommended by Mr. Boswell, whose classical treatise on watering meadows we have already had occasion to notice.

First, observe the piece of land or field best adapted to this purpose, both in point of soil and of situation. In case it be arable, it should be previously laid very level, and with the crop of corn all sorts of hay-seeds should be sown; and, as soon as a green sward is formed, it may be laid out. Next, in the lowest part of the ground, is to be drawn a deep ditch, in which the current may run through it; which ditch should be continued into some other ditch, or low part, in the subjacent lands, in order that the water may be freely carried off after it has been employed, and also while it is in use. Then let ditches be drawn above the field intended to be watered, aslant the sides of the hill, in such a manner that they may all discharge themselves into the head of the ditch above mentioned, just where it enters the field to be watered. A weir being then erected across this ditch, the field may be watered, according to the situation of the ditch, either in the middle or one side. It must then be conveyed by small mains, or trenches, and subdivided again by branch-trenches, according to the site of the field, and the quantity of water that can be collected. Of the immense advantages arising from water thus collected and distributed over land, (which is mostly a firm, good soil), those who are unacquainted with water meadows can form only an inadequate conception; for the water running down from rich cultivated hills, eminences, &c. carries along with it, during very heavy rains, immense quantities of dung dropped by sheep and other cattle, and the manure spread on arable lands; which, being thus conveyed over the intended meadow with an easy descent, allows time for the particles of manure to subside upon the ground at one
season, or to be filtered through the young grass as it dribbles through it at another; and the subsequent warm weather greatly accelerates vegetation. Meadows thus situated, Mr. B. remarks, would be vastly superior to any others, if they had the advantage of a constant stream; though, even under the present existing circumstances, they will prove to be very valuable, if every opportunity be taken to water them with every heavy rain, or land flood, that occurs. And he strenuously advises the occupier of such lands, on no account to lose time in appropriating them to this use, because such lands are healthy for all kinds of cattle, at almost all seasons; while the expense of converting them into this kind of water-meadow is exceedingly small, the subsequent annual charges are very trifling, and the produce is very considerable*. In addition to the benefit resulting from this mode of employing land floods, it may be remarked, that farm-yard liquor (which at present is often totally lost by evaporation) is capable, on elevated situations, of being applied in a similar manner, if it can be procured in sufficient quantity; though, in other situations, there is no doubt but that it may be artificially raised and diverted over the fields contiguous to the farm with the greatest benefit†.

In regard to the proper time for flooding or irrigating lands, it may observed, that this valuable improvement may be performed at any period of the year; though winter and spring, or from the the latter end of October to the beginning of March, are the two usual seasons for watering meadows; but experience and local circumstances are the best guides in this important operation. Supposing, therefore,

* Boswell, p. 97.

† This method of employing farm-yard liquor has been successfully attempted by Mr. Fenna, whose interesting account, which the protracted length of this article forbids us to state, is accurately detailed in the "Communications to the Board of Agriculture," vol. ii.
that in October or November, which is the usual time in Gloucestershire, from heavy rains there is sufficient water for the whole number of meadows, (and, as already intimated, it is most advantageous to have three or four water-meadows if possible), the mains, carriages, main-carriers, or feeders, as the main-trenches are variously termed, will be filled, and thence it will flow into the other trenches; when these are full, the edges of the mains, trenches, and drains are directed to be mown on both sides with a short scythe; when the water carries the dead grass, &c. as it is cut, down to the ends of the trenches, where it must be taken out with a fork, and thrown up into small cocks, to be carted off at the earliest opportunity. This necessary duty being performed, the operator, or waterman, goes up and down the main to see whether the water has risen to the requisite height; when any spots in the banks, that may be too low, should be raised to a proper level with small spits of green sward; and such as are too high must be pared down, so as to reduce the banks of the carriages or feeders to as accurate a level as possible, in order that the water may dribble properly over the meadow. The lateral and other trenches are to be frequently examined and leveled, or raised, and all obstructions removed, as circumstances may require, in a similar manner. The various drains must likewise be often inspected; if the water fill them, and rise over upon the edges, Mr. Boswell directs them to be widened, in case they cannot be made deeper; in this instance, however, very great floods are not to be regarded as the criterion, but a strong body of water.

Concerning the length of time during which the water is, at this period of the year, to continue on the land, there is a difference of opinion. Mr. Boswell thinks that the water may, with safety, be kept a month, or even six weeks, on corky, boggy soils, or strong clays; though a shorter period will be sufficient for a sandy or gravelly soil.
But Mr. Wright (in his "Art of floating Land,")) is of opinion, that three weeks are sufficient for this purpose; we conceive, however, with Mr. B. that for the first-mentioned lands four or six weeks are not too much, because very boggy and swampy lands require more and longer watering than such as are of a drier nature. The larger the body of water that can be distributed over the former, the more beneficial will be the effects resulting from the practice of irrigation; for the weight and strength of the water will greatly assist, as already intimated, in compressing the soil, and also in destroying the roots of the aquatic weeds that vegetate on it. Neither can the water, in Mr. B's estimation, be well kept too long upon it, especially in winter, immediately after the after-math is eaten, for the closer it is fed the better; and this kind of soil, when well watered and drained, will equal the wishes of the most sanguine in its improvement. On warm sand, or gravelly soils, (which are most profitable where they can be flooded at pleasure), a contrary practice must be adopted; the water ought, on no account, to be kept long at a time upon the land, but should be frequently shifted, the land well drained, and "thoroughly refreshed with it.*"

In December and February, Mr. Wright advises the meadows to be laid dry, and to turn the water over it at night; otherwise, "if the water is suffered to remain for many days, a white scum arises, very destructive to the grass; which scum is raised chiefly when the sun is warm, and the water clear and thin." And if the land be now exposed, "without the covering of the water, to a severe frosty night, the greatest part of the grass will be killed;" whereas, by adopting the expedient above suggested, both these injuries, according to Mr. Wright, may be avoided. Or, the water may be taken off early in the morning; "and, if the day be very dry, the frost can do no injury, for

* Boswell, p. 32.
it is only when the land and grass are wet, that the frost has this pernicious effect."

From this method of proceeding, Mr. Boswell, however, does not apprehend any dangerous consequences would arise. In regard to the supposed fatal effects of frost, the contrary appears to be the case; and the late Dr. Darwin (in his interesting work, entitled "Phytologia; or, the Philosophy of Husbandry and Gardening) has suggested, that irrigation, in this island, may prove serviceable in protecting grass and other vegetables from the too severe effects of intense cold during winter, or in the vernal season.

With this view he remarks, that the water of strong springs, (whose temperature is in this climate constantly 48° of Fahrenheit's thermometer) is preferable to river water, where a sufficient quantity of the former can be procured for the purposes of irrigation; the degree of cold in these two fluids being in a similar ratio with that of the atmosphere, till it declines to the freezing point, or 32°. Both river and spring waters, however, when distributed over the land, forming a thin sheet of ice on its surface, are beneficial; inasmuch as they defend the roots of grasses from the severe effects of too intense cold, and thus preserve them in a more healthy state. And thus the quantity of grass, in this cold climate, may be materially increased; so that, under judicious management, the annual proportion will now be nearly double that produced under other treatment and other circumstances. In confirmation of Dr. Darwin's suggestion, we would remark the following fact: it often happens that the frosts of one night fix the hatches, or flood-gates, that admit water into the wears from rivers, so fast, that they cannot be removed until the frost breaks. Consequently, meadows are thus covered perhaps for several weeks with a sheet of ice, produced by a severe frost setting in while they are flooded; and after the frost is removed,
those meadows always exhibit the finest verdure, and at the earliest period of the year.

With respect to the white scum above mentioned, it is clearly shown, by Dr. Darwin, to be generated by stagnation of water, and consequently is the effect, rather than the cause, of injury to the growth of grass plants. It may always be obviated while the weather is open, by suffering the water to dribble or trickle gently over the meadow from the higher parts; though, as Mr. Boswell justly observes, the rays of the sun are rarely found to be sufficiently strong, to have any effect upon the water in the month of February. Nor is it an uncommon thing, he adds, in that month, to have the water kept upon the meadows for a fortnight or longer.

The system of watering, indeed, as recommended by that gentleman, appears to us preferable to any other; accordingly, after the lands have been floated four or six weeks, in November (as already intimated, p. 315,) he directs the water to be turned out of one part of a field into another, and thence in the same into a third part, when it may be taken back again to the part first watered; a fortnight or three weeks will then be a sufficiently long time for the water to remain upon the ground. Thus, that fertilizing fluid may be continued shifting from place to place; care being taken to examine attentively the various works, and to remove all obstructions. As the days increase in length, and the weather becomes gradually warmer, a proportionably less time (for instance, after Candlemas a fortnight, and the next turn a week,) will be fully adequate for the purpose.

These various operations will bring the season to the commencement or middle of March, at which time there will be an abundant bite of sweet pasturage. As, however,

* Boswell, p. 117.
the management of meadows, after they are flooded, will be with more propriety discussed in a subsequent section of this chapter*, we shall conclude the subject of irrigation with a concise statement of the numerous advantages that have already occurred, or which may be derived from a judicious and spirited adoption of this most important branch of rural economy.

The system of irrigation is carried on to the greatest extent in the counties of Wilts, Dorset, Hants, &c. and particularly in Gloucestershire, the farmers of which last-mentioned county are thus enabled to commence the making of cheese at least one month sooner than those of other districts, who have not the same opportunity. So highly, indeed, is water prized for this purpose in Gloucestershire, that the privilege of keeping up the water for turning corn mills, is regarded as a grievance; and those who have this privilege, obtain high rents for the temporary use of the water. In illustration of this circumstance it may be added, that on the river Churn, which is a branch of the Thames, there are ten corn mills erected on a stretch of five miles of the water's course, which yield annually four hundred pounds. Upon the same stretch there are one thousand acres of meadow, supposed to be improved by irrigation to two pounds per acre of yearly rent above their former value, although they are of necessity but imperfectly watered from the obstruction of the mills; thus producing a difference of one thousand six hundred pounds annual rent, in the different mode of using the water!!

Farther, not only are common meadows greatly enriched, and boggy lands reclaimed by the proper application of water, as already hinted, but also its utility is yet more clearly evinced from this circumstance, that from the uncommon forwardness of the grass, the feeding between the months of March and May is worth one guinea an acre; in June, one

acre of water-meadow will yield two tons of hay, which sells, at different times, from twenty-five shillings to five pounds per ton, according to the quality and quantity of the herbage, and the extent of the demand; and the eddish, or after-grass, may be valued at fifteen, if not twenty, shillings an acre, whether the season be wet or dry.

Upon the whole it is evident, that irrigation is not only a great improver of land, but is likewise capable of being carried on to the greatest extent in almost every situation, by seizing and making use of the various convenient situations afforded by nature, and by calling in the aid of machinery for conducting water into those situations where it would otherwise be impracticable to flood land. It ought not, however, to be concealed, that an apparently formidable objection has been started against this system of improvement, which may possibly produce unfavourable impressions in the minds of persons otherwise disposed to favour it, viz. that the great body of water thus constantly spread on the surface of the earth must necessarily render the surrounding atmosphere humid, and consequently prove injurious to the health of the inhabitants. But no such apprehensions need be entertained, provided the irrigation be properly conducted; as in this case the water is always in motion, and of course cannot possibly stagnate, or exhale any noxious vapours.

§ 8. Warping.

The improvement of land by warping is one of the most singular that has ever been brought before the agricultural world; and its effects greatly exceed those produced by any other mode. It consists in admitting the tide of large rivers to deposit their sediment, or warp, and letting it run off again as the tide ebbs. Such is the aim and effect of this remarkable process; but, in order to render it efficacious, the water must be perfectly at command, so as
to be excluded or admitted at pleasure. Hence it is necessary not only to cut a canal communicating with the river, but also to have a sluice at the mouth, which may be opened or shut as circumstances may require; while, in order that the water may be of a proper depth on the surface of the ground to be warped, and also for preventing adjacent lands from being overflowed, banks are raised around the fields to be warped, from three or four to six or seven feet in height, according to circumstances. Thus, says Mr. Young, if the tract be large, the canal which takes the water may be made several miles in length; it has been tried as far as four, so as to warp the lands on both sides the whole way, and lateral cuts may be made in any direction for the same purpose; allowing the water longer time to deposit its sediment; because the effects decrease in proportion as it recedes from the river*

The following practical hints for conducting the important process of warping, we give in the words of the Right Hon. Lord Hawke, selected from the "Survey of the Agriculture of the West Riding of Yorkshire."

"The land," observes his lordship, "to be warped, must be banked round against the river. The banks are made of the earth taken on the spot from the land; they must slope six feet; that is, three feet on each side of their top, or crown of the bank, for every foot of perpendicular rise: their top or crown is broader or narrower, according to the impetuosity of the tide, and the weight and quantity of water, and it extends from two feet to twelve; their height is regulated by the height to which the spring tides flow, so as to exclude or let them in at pleasure. In these banks there are more or fewer openings, according to the size of the ground to be warped, and to the inclination of the occupier; but, in general, they have only two sluices, one called the flood-gate, to admit; the other called the clough, to let off

the water gently; these are enough for ten or fifteen acres. When the spring tide begins to ebb, the flood-gate is opened to admit the tide, the clough being previously shut by the weight of water brought up the river by the flow of the tide. As the tide ebbs, the weight or pressure of the water being taken from the outside of the clough next the river, the tide-water that has been previously admitted by the flood-gate opens the clough, and discharges itself slowly, but completely through it. The cloughs are walled on each side, and so constructed, as to let the water run off, between the ebb of the tide admitted, and the flow of the next; and to this point particular attention is paid. The flood-gates are placed so high as only to let in the spring tides when opened. They are placed above the level of the common tide.

"Willows are also occasionally planted on the front of the banks, to break the force of the tides, and defend the banks by raising their front with warp thus collected and accumulated; but these willows," Lord H. remarks, "must never be planted on the banks, as they would destroy the banks by giving the winds power to shake them."

The effect derived from warping differs greatly from that produced by irrigation; for it is the mud, and by no means the water, which produces the effect; so that in floods, and also during winter, this business entirely ceases. In fact, its tendency is not to manure but create soil; hence the nature of the land is a point of little moment, almost every soil, whether peat, sand, bog, or clay, but especially light land, being equally benefited, as the warp raises it in one summer from six to sixteen inches in thickness; and, in low places, or hollows, two, three, or four feet, so as to leave the surface level. "Thus," Mr. Young observes, "a soil of any depth you please is formed, which consists of mud of a vast fertility, though containing not much besides sand; but a sand unique." From a careful analysis
by an eminent chemist, warp consists of a large quantity of mucilage, a very little saline matter, and much calcareous earth; the residue is mica and sand, the latter in much the largest proportion, but both being in extremely attenuated particles; and Mr. Y. conjectures (though no notice is made of any argillaceous ingredient) that some warp must contain clay, from the circumstance of its forming small clods and cleansing cloth from grease, not unlike fuller's earth. He adds, that in the opinion of a considerable warp-farmer, the stiffer sorts of warp are the best.

A remarkable instance of the beneficial effects resulting from the practice of warping, occurs in the farm of Mr. Webster, of Bankside, which contains 212 acres, and is entirely warped. To evince the immense importance of this improvement, it may not be useless to state, that he gave 11l. per acre for the land, for which he would not at present take seventy pounds per acre: he thinks it worth 80l. and some parts even worth one hundred pounds; not that it would now fetch so high a sum. His whole expenses for sluices, banks, cloughs, &c. did not exceed 2500l. or 12l. per acre; which may, indeed, be reduced to 1000l. or 5l. an acre, as a neighbour below him has offered 5l. an acre, for the use of his sluice and main cut, to water three hundred acres. Estimating, however, at the highest sum 12l.—11l. the purchase money, must be added, making in the whole 29l. per acre; which, if he can sell at 70l. leaves a clear profit of forty-seven pounds per acre: a prodigious sum, which, Mr. Young remarks, is sufficient to prove that warping exceeds all other improvements.

Mr. Webster has warped to various depths, from eighteen inches to two feet, two feet and a half, &c. and he has some moor land, which, previously to being warped, was worth only one shilling and sixpence per acre, that is now as good as the best land; and some of which would let at

gl. for flax or potatoes, and the whole for 50s. an acre. Our limits forbid us to enter into farther particulars respecting the efforts of this enterprising agriculturist; hence we shall only mention a few circumstances relative to the crops, which his warped land has produced.

Of potatoes he has had from eighty to one hundred and thirty tubs, of thirty-six gallons per tub; selling the round sorts from three shillings to three shillings and sixpence the tub; and kidney potatoes from five to eight shillings. Six acres of beans yielded thirty loads, or ninety bushels per acre; and one acre (which was measured, in order to decide a wager) is stated to have yielded ninety-nine bushels: one bean, on four stalks, has produced 144 pods; and Tartarian oats have been seven feet in height. Mr. Webster warped one piece in 1793, which, in the following year, produced six quarters of oats per acre; white clover and hay-seeds were sown with the grain, and mown twice in the first year: the first cutting afforded three tons weight per acre, the second one ton, and after that appeared an immense eddish or after-grass. It ought, however, to be observed, that warp brings weeds, especially mustard, cresses, and wild celery, with abundance of docks and thistles; but it destroys rushes and similar aquatic weeds.

The cost of a sluice for warping, that is five feet in height, and seven feet in width, is estimated by Mr. Young to be from four to five hundred pounds. Such a sluice will be adequate to the warping of fifty acres annually (Farm. Cal. p. 394); and, if the soil be contiguous to the river, it will be sufficient for seventy.

The practice of warping commences in the month of June, and is carried on throughout the summer; in fact, that is the only season, in which this admirable improvement can go on, and therefore the agriculturist ought carefully to avail himself of every tide, and to keep his works in constant repair, that he may not (if possible) lose the be-
nefït of a single tide through neglect, or any other untoward circumstance. This method of ameliorating land is at present chiefly confined to the farmers residing on the banks of the Don, Ouse, and Trent, to whom it proves a source of immense profit; hence it is highly probable, that the practice of warping may be successfully adopted on low lands adjoining to rivers, the tides of which are often impregnated with mud.

SECTION III.

Of Manures in general, and their application to tillage, grass, and meadow Land.

The manuring of land is that operation, by which those substances are communicated to land from which vegetables can draw a sufficient degree of nourishment. Under the term manure is included every substance, that is calculated to afford such nourishment, and to ameliorate the soil, either by remedying or improving its natural poverty, or by correcting its too great looseness, stiffness, or other qualities which retard vegetation.

Manures may be divided into five classes, vegetable, animal, fossil, fluid, and compound; each of these classes forms a distinct subject of consideration, to which we shall annex some remarks on the best modes of collecting and preserving manures, and their application to grass and tillage land.

§ 1. Vegetable Manures.

In this division either entire plants, or parts of vegetables, are comprehended, together with their ashes, roots, &c. which are sometimes turned in by the plough, while they are growing, or after they have been burnt, or otherwise decomposed.

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1. *Vegetable ashes* are, in general, most effectual for manuring cold, marshy, boggy, moist, and uncultivated soils; of the various kinds of ashes in use, those of peat are, perhaps, best calculated both for grass and arable land. The most valuable are obtained from the slow combustion (similar to that of making charcoal) of the lowest stratum of peat, where the fibres and vegetable roots of which peat consists, are most decayed. After the peat is collected into a large heap, and covered to prevent its flaming, it must be suffered to consume slowly, till the whole is completely incinerated, or reduced to ashes. Thus burnt peat ashes, as well as those of fern, stubble, &c. may be applied with great advantage on sour meadows, where they destroy rushes and other aquatic weeds, and produce, instead of these, abundant crops of good grass. Peat itself may, however, be laid on clayey soils with great advantage; and the late Dr. Darwin has suggested, that its decomposition may be accelerated, by previously throwing it into heaps, either with or without the addition of lime, and afterwards by exposing it to the air, and drawing the superfluous moisture from it.

2. *Straw*, when reduced to ashes, has been spread with great benefit on land, in the proportion of four, five, or six tons per acre; this species of manure has been chiefly employed in Yorkshire, as a dressing for turnips; but as straw may be advantageously employed in soil ing cattle during the winter season, it has been suggested to collect and stack the *stubble* which cattle will not eat, and burn it before sowing turnips.

3. *Weeds*, in general, are likewise of great service, particularly if they be cut down in their most succulent condition, shortly before they flower; as they are then not only most disposed to putrescence, but also the injury that would otherwise result from the germination of their seeds will thus be effectually avoided. Hence weeds ought not, as is too frequently the practice, to be heedlessly burnt or thrown
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into the highway; but, if they be spread on the ground in their juicy state, in heaps, and occasionally turned over and covered with soil, they will certainly perish and speedily become putrid. The application of quicklime to weeds will also greatly promote their decomposition; for this purpose it has been recommended, by Mr. Brown, of Derby, to form a stratum or layer of green vegetable matter, about one foot thick; on this is to be scattered a thin layer of powdered lime, continuing such strata till the pile is of sufficient height. In the course of a few hours, a decomposition of parts will take place, when the heaps should be covered with a few earthen sods, or a little addition of vegetable matter, to prevent the mass from taking fire: at the end of twenty-four hours the dissolution of the vegetable matter will be complete, and a quantity of excellent ashes will be obtained, ready to be immediately spread on the land. Dry vegetable recrements may be treated in a similar manner, by previously keeping them in a state of moisture, in order to accelerate their decay; but without suffering water to become stagnant upon them, or allowing cattle to trample too much upon them in the yard.

4. Sea weed is another vegetable manure that may be used with the greatest profit, where the situation of a farmer gives him access to this material. The best-mode of applying sea weeds is to cut them, while in their most succulent state, from the rocks on the sea-coast, and plough them in; because much of their enriching matter will be dissipated by exposure to the air. Where, however, they cannot be procured in their juicy state, it will be advisable to collect the weeds when thrown on the shore, and plough them in immediately; or, if they be not wanted for speedy use, they may be formed into heaps, with thin strata of lime, and treated in the manner already suggested with regard to weeds in general.

4. River or pond weeds are capable of a similar applica-
tion, and with great benefit, on loose sandy soils intended for turnips; though it is to be observed, that such weeds have no effect whatever on wet springy lands, or on those which are liable to be inundated. The proportion to be laid on is twelve or fourteen loads an acre.

5. Rape or cole-seed cake reduced to a coarse powder, after all the oily particles have been expressed from the seed, is also said to be a useful manure as a top dressing for turnips: it is usually scattered by hand, and harrowed in with the seed of the intended crop. On account of its unusual dryness, this sort of manure is best used in moist seasons, when the rain disposes it more speedily to decomposition; the quantity to be spread varies from four to five quarters per acre.

6. Malt dust, or the refuse which is screened from malt in drying, affords an excellent vegetable manure, particularly the black dust; because, in this last sort, the seeds of charlock, with which it usually abounds, are completely destroyed by exsiccation. For grass lands it is very beneficial, in the proportion of sixty bushels per acre; but it is best calculated for cold clays, or stiff loamy soils, as in gravelly situations it is apt to burn the soil. Should, however, the ensuing weather be wet, malt dust will be very useful, as it is washed into the ground by the first shower, and an abundant crop is secured, while the vegetation of noxious weeds (that are usually generated by the use of common dung) is effectually prevented.

7. Oak bark, or (more correctly speaking) tanners' waste, may be accumulated into small heaps, and mixed with lime and a sufficient degree of water to keep it moist, and promote its decomposition and putrefaction. It is an excellent manure for cold, stiff soils, whether arable or grass land; but, for the latter, it should be made to approach the nature of vegetable mould as much as possible. The best time for spreading it on grass lands is shortly after Michaelmas, that the winter rains may wash it into the ground; as, if it be
applied in the spring, it will burn the grass, and exhaust rather than improve the soil for that season.

8. Considerable benefit has likewise been derived from ploughing in tares, rape, vetches, early-sown buck-wheat, and other succulent vegetables; but, whatever the vegetable may be, it ought to be ploughed in, says Mr. Young, with a skim-coulter plough, which is the only means of turning it so completely in as to conceal it entirely from the eye. The best period of the year for this purpose is about midsummer, as the plants are then not only in full sap, but the warmth of the weather will very materially promote the fermentation. Where this method of manuring land is intended as a dressing for turnips, it ought to be done at least three weeks before the seeds of those valuable roots are sown, when that seed should be lightly harrowed in. But *turnips* themselves, when, through any unforeseen accident, they are injured by frost, may be treated in this manner with great benefit to the succeeding crop, as they are believed to prevent the germination of the seeds of weeds found in dung; and, when stirred among the latter, the turnips accelerate their putrefaction.


On account of the rapid tendency to putrefaction of animal substances, when divested of the vital principle, they have been found to afford the most ready and abundant nutriment to vegetables. The first we shall mention is,

1. *Dung*, of which that dropped by fat cattle is justly remarked by Mr. Middleton, in his interesting "Agricultural Survey of Middlesex," to be richer, and of course to possess more fertilizing properties, than the dung of lean cattle. Thus the dung of those fed with rape, linseed, or other oleaginous seeds, is the richest; that of animals supplied with oil-cake, or those seeds, of which the oily matter
has been expressed, is next in point of fructifying powers; then the dung of cattle fed on roots; next, that of such as are supplied with hay, varying according to the goodness of their keep; and that of straw-fed cattle, especially lean beasts, is the poorest of all.

With regard to the relative powers of animal dung, it may be observed, that horse-dung, when not too new, is admirably calculated for cold, steril, and poor ground; while that of neat cattle is better adapted to hotter soils; but both, when combined together, or with mud, form a useful manure for either of those soils. For cold clays, the dung of swine is conjectured to be of a fatter and richer nature than that of any other beast, and is said to be particularly excellent for grass lands; one load of hog’s dung being averred to be more fertilizing than two of any other animal excrement. The pulverized dung of deer and sheep (the properties of which do not materially vary) is, in the judgment of agriculturists, best calculated for cold clays: the quantity per acre is from four to five loads, to be thinly scattered over the autumnal, or vernal, crops in the same manner as ashes*. The dung of poultry, particularly of pigeons and geese, is of great service in the improvement of meadows; especially that of the last-mentioned fowls, which is asserted to contribute to the fattening of sheep in a very material degree, those animals being most partial to, and thriving best on, pastures that have been manured with goose-dung. Lastly, the soil, or excrementitious matter of privies, is believed to excel every other species of

* The common mode, however, of applying sheep’s dung is by folding, a practice, the utility of which has been already discussed; but it should seem, that most of the benefit thus obtained is derived from the consolidation of land affected by their treading, and from their urine; to which may, perhaps, be added the perspirable matter exuded from their fleeces while lying down upon the ground.
manure, for the first year of its application; in the second, Mr. Middleton states, ("Transactions of the Society for the Encouragement of Arts," &c.), that its beneficial effects are less evident; but in the third, they nearly, if not altogether, disappear. The proportion for land in good condition is estimated by Mr. M. to be about two loads annually; which, he thinks, will always preserve its fertility. He adds, that exhausted land may be perfectly restored by the application of four or five (Middlesex) loads of such soil on each acre for the first year, after which two loads annually will be sufficient to retain the land in a high state of cultivation; and that the herbage produced by land thus manured, is capable of fattening the largest cattle in a smaller compass of time than any other. It will, however, be advisable, on account of the generally fluid state in which the excrementitious matter of privies is usually found, to combine it with some peaty or earthy matter, which the volatile alkali, evolved by the decomposition of the ordure, may reduce into the requisite degree of solubility, for facilitating the growth of plants; thus, much benefit will be derived, both in the quantity and the quality of the manure.*

2. Where greaves, or the refuse of tallow-chandlers, after making candles, the chippings or waste of curriers and fell-mongers, the clippings and shreds of shoe-makers and furriers, and the waste or refuse of glue-makers, can be obtained in sufficient quantities, and this (advantage can only be enjoyed in the vicinity of large towns or cities), they afford an uncommonly useful manure for obtaining immediate crops; but their effects are by no means so per-

* For this interesting fact, we are indebted to the Earl of Dun-donald's valuable "Treatise on the Connection of Agriculture with Chemistry," 4to.; a work deserving the attention of every intelligent agriculturist.
manent as those produced by other animal substances, on account of their great attraction of moisture.

3. Fish, such as pilchards, herrings, mackarel, muscles, and other shell-fish, afford a useful species of animal manure, to which purpose they are applied in those parts of Britain, where such fish are found in the greatest abundance. To these may be added, the refuse blubber remaining after the oil is boiled out, the offals of large fish (great quantities of which may be easily procured in large cities or maritime districts), and the stickle-backs*, a common fish in all rivers and ditches, of which (in some parts of the county of Cambridge) twenty bushels are strewed over an acre of land. The common mode of using these animal substances is by spreading them on the soil alone; hence much of their fertilizing properties are necessarily lost and wasted, which might be preserved (while the offensive effluvia thence arising might be prevented) by a judicious combination: first, of a little effete lime; and afterwards, of double or treble the quantity of the whole of good vegetable mould.

4. Unboiled bones, broken very small, not exceeding the size of small marbles, are likewise an excellent manure, according to Dr. Hunter, upon poor calcareous soils, at the rate of sixty bushels per acre. Their effects, however, especially upon grass lands, are more evident and more beneficial the second year than in the first.

5. For chalky lands, the refuse of horn shavings are likewise of great advantage as a manure, in the proportion of fourteen or sixteen bushels per acre. When combined with hotter manures, and spread on light gravelly lands, they afford a useful corrective of the latter, which they prevent from burning the soil; as horn shavings are found to attract the dew, and to be retentive of moisture.

6. The soiled or damaged locks of wool, or trimmings

* The Gasterosteus aculeatus of the Linnaean system.
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of sheep, and, generally speaking, woollen rags, afford excellent manures; the former are used chiefly in the county of Surry, the latter in Kent, in the proportion of from six to ten hundred weight per acre. On account of their possessing a less quantity of oleaginous matters, or of mucilage, they require to be reduced into small pieces in a paper-mill, then strewed upon the ground, and ploughed in about three months before the intended crop is sown.

§ 3. Fossil Manures.

Under this division are comprised various kinds of earth, lime, marl, clay, &c. which vary in their effects, and all of which contribute in a greater or less degree to improve the land, according to the nature of the soils and proportions in which the fossil manures are applied, and the various articles or substances, of which they are composed.

1. One of the most useful manures of this class, that has of late years been introduced into rural economy, is crag, or the shelly sand deposited in strata, in the neighbourhood of the British coasts. These beds are generally found in crevices and level parts of the shore, though they are often met with at the height of forty or fifty feet above the level of the sea. From the quantity of fine calcareous matter, produced by the friction of marine shells, and similar substances, as well as animal matters combined with it, crag may be beneficially employed as a manure; especially as it retains a portion of sea-salt, which greatly promotes the decay and putrefaction of vegetable and animal substances. This kind of manure is best calculated for correcting cold, clayey, or loamy soils, on which it will produce most abundant and luxuriant crops: the quantity per acre is from eighteen to twenty tons, though the peculiar nature and other circumstances of soil or situation, as well as the greater or less portion of calcareous matter it
contains, will necessarily cause a fluctuation in this respect. But Dr. Anderson has observed, that a considerably less quantity of calcareous matter, when finely attenuated, as in the case of crag, will produce more sensible effects, than when applied in the state of earthy marl, being spread more equally upon the land, and more intimately blended with the soil.

2. Clay, after it has been burnt, ameliorates wet, cold, and sandy soils, and stiff, cohesive lands: this sort of manure is chiefly used in the North Riding of the county of York, where the ground is so sandy as to yield, with the application of other manures, only rye; while, with clay, such land produces abundant and luxuriant crops. The quantity per acre varies from ten to twelve loads; and so lasting are the fertilizing qualities of this fossil manure stated to be, as to render a repetition of claying for forty-five years unnecessary.

3. Chalk. Of this fossil there are two sorts: the one soft and unctuous, which supplies the best manure, in its natural state, for lands; the other hard, firm, and dry, which is best adapted to the purpose of burning into lime. Either kind, however, affords an excellent manure for compact clayey soils, into the pores of which it insinuates itself; and by producing a fermentation therein, exposes the clay to the action of the sun, air, rain, and frost, so that its too-cohesive particles become loose, and it is reduced to a state of pulverization. But the Kentish chalk does not produce these effects on the clays of that county that are situated near the pits, though it agrees extremely well with other clays; probably, on account of the Kentish clays being of a chalky nature, so that the quality of the manure is nearly of the same nature as the soil. Chalk, however, may be very usefully employed on sandy grounds, the interstices of which it fills up, and thus renders such soils sufficiently compact for the purposes of vegetation,
while it totally extirpates the pernicious *Chrysanthemum segetum*, yellow ox-eye, or common marigold, a noxious weed, which peculiarly infests lands of the last-mentioned description.

4. *Coal-ashes*, when properly preserved, are eminently calculated for cold clayey lands, into which, however, they ought not to be too deeply ploughed. They likewise supply an excellent top-dressing for clover, on dry chalky soils, in the quantity of fifty or sixty bushels per acre, scattered in March or April; and are equally beneficial on grass-lands, on which they are spread either during winter, or in the course of the following spring. The quality of coal-ashes may be much improved, by covering up in every cart-load of ashes one bushel of lime, in its hottest state, for about ten or twelve hours, when the lime will be entirely fallen. The whole is now to be well mixed together, and turned over two or three times, when the cinders, or half-burnt pieces of coal, which would otherwise be of no use, will be reduced to as fine a powder as the lime itself. It should, however, be remarked, that in order to obtain this benefit from coal-ashes, they ought to be kept perfectly dry; and, when thus prepared, they are stated to improve swampy, moorish soils very materially, and in a very short time.

5. *Leached or soap-boilers’ ashes*, are also possessed of eminently fertilizing properties, and are particularly useful for swampy soils, as they effectually destroy rushes and other aquatic weeds. This sort of manure is much used in the United States; where, as appears from a memoir of Mr. L’Hommedieu (in the “Transactions of the Agricultural Society of New York,” vol. i.), ashes are found to succeed best on dry loamy lands, or on loam mixed with sand. Ten loads of this manure on poor land, it is stated, will in general produce twenty-five bushels of wheat per acre, which defrays the expence of raising the crop by
more than one half. The land is then left in a state for yielding a crop of hay, containing from one and a half to two tons of hay per acre, for several successive years.

6. **Gypsum, or plaster stone**, as it is sometimes termed, is a native combination of calcareous earth with vitriolic acid; which, though easily reduced to powder in the fire, is almost as difficult of fusion as limestone: it abounds in various parts of England. This fossil has only been introduced into rural economy within a few years; but its uncommonly fructifying properties render it deservedly an object of notice, as the subsequent facts, drawn from actual experience, will evince.

In the "Letters and Papers of the Bath and West of England Society," vol. v, there is an interesting communication on the subject of gypsum as a manure: The correspondent states, that he covered a piece of grass land, to the thickness of two inches, with barn manure; and scattered pulverized gypsum on another piece of the same land, in order that he might compare the effects produced by each of those articles. The two pieces were mowed twice in the same year, and once in the year following, when the gypsum crop was in every instance the most productive. Exhausted sandy uplands, that had been abandoned, have been restored to a degree of fertility by the use of this fossil, whose effects on cabbages and turnips were equally beneficial: but gypsum appears to be best calculated for chalky and dry calcareous lands. The vegetable crops that appear to be most improved by the use of this manure are, clover, grass, and saintfoin. In order to apply the gypsum with effect, it ought to be previously pulverized, or reduced to small pieces by means of mill-stones, where these can be commanded; or, which is a more tedious process, by the hand with hammers. When thus reduced, it may be strewed over the land at any period of the year, in the proportion of eight or nine bushels per acre; but the most
proper season for this purpose is previously to the falling of gentle showers, as these will materially promote the efficacy of the gypsum. Hence the months of February and March appear to be the most proper seasons for this purpose; and eight bushels per acre are stated by Mr. Kirwan, in his valuable "Treatise on Manures," to be fully sufficient for grass land, as a larger quantity would prove injurious to the soil.

The beneficial effects of gypsum, however, considered as an article of manure, will be more clearly evinced by the annexed experiments, than by any deductions or inferences we could make on this subject; they are selected from Mr. H. Smith's valuable "Essay on Gypsum as a Manure," (in "Communications to the Board of Agriculture," vol. iii, p. 337). Having a field of clover, part of which had not been manured with gypsum, and the produce of which was beyond all comparison inferior to that whereon the gypsum had been spread; he carefully manured two square perches, (in order that he might ascertain the precise value of the hay-crop), within a foot of the line that separated the part sown with gypsum from the other, weighing the contents of each, and having paid equal attention to the two contrasted perches when cut for seed. The produce of these spots is stated in the annexed experiments.

**EXPERIMENT ON RED CLOVER, IN 1800.**

**CLOVER HAY PRODUCT.**

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<th></th>
<th>Per perch.</th>
<th>Per acre.</th>
<th>Value at 6s. per-cwt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Gypsum</td>
<td>lbs. oz.</td>
<td>cwt. qrs. lbs.</td>
<td>l. s. d.</td>
</tr>
<tr>
<td>b. None</td>
<td>42 0</td>
<td>60 0</td>
<td>18 0 0 0</td>
</tr>
<tr>
<td></td>
<td>14 0</td>
<td>20 0</td>
<td>6 0 0 0</td>
</tr>
</tbody>
</table>

A A
## Clover Seed Product

<table>
<thead>
<tr>
<th></th>
<th>Clover straw per perch.</th>
<th>Clover straw per acre.</th>
<th>Amount at 12d. per cut.</th>
<th>Seed per perch.</th>
<th>Product per acre.</th>
<th>Value at 12d. per lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Gypsum</td>
<td>lbs. oz.</td>
<td>cwt. qrs. lbs.</td>
<td>l. s. d.</td>
<td>lbs. oz.</td>
<td>cwt. qrs. lbs.</td>
<td>l. s. d.</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>22 3 12</td>
<td>1 2 9 10</td>
<td>0 3 21</td>
<td>5 5 0</td>
<td></td>
</tr>
<tr>
<td>b. None</td>
<td>3 8</td>
<td>5 0 0</td>
<td>0 5 0</td>
<td>0 0 20</td>
<td>1 0 0</td>
<td></td>
</tr>
</tbody>
</table>

Amount of hay product, with gypsum 18 o o
Ditto, without gypsum 6 o o
Extravalue by gypsum 12 o o
Deduct expense of gypsum 1 0 0
Clear gain by gypsum 11 0 0

Amount of gypsum, seed value 5 5 0
Ditto, without gypsum 1 0 0
Clear gain by gypsum 4 5 0

Total clear gain by gypsum, viz.

<table>
<thead>
<tr>
<th></th>
<th>l. s. d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>By hay-crop</td>
<td>11 0 0</td>
</tr>
<tr>
<td>By seed</td>
<td>4 5 0</td>
</tr>
<tr>
<td>By straw</td>
<td>0 17 9</td>
</tr>
<tr>
<td>Total gain</td>
<td>16 2 9</td>
</tr>
</tbody>
</table>

Thus there is, says Mr. Smith, 16l. 2s. 9d. clear gain from five bushels of gypsum: he also states that, exclusive of this clover, he had ten acres of lucern, five acres of saintfoin, and three acres of Dutch clover, dressed with five bushels per acre, which to all appearance received equal benefit. Before we conclude this article, we would add, that Mr. S. conceives five or six bushels per acre to be amply sufficient on very weak and exhausted soils; and as pot-ashes are used in extracting the vitriolic acid from this
fossil, he conjectures that some part of the alkaline salt is imparted to the calcareous earth, and that thus we may account for the uncommon effects of gypsum upon chalky soils. But the celebrated practical chemist, Mr. Kirwan, deduces the theory of the effects of gypsum from its uncommon septic properties, though this theory has been questioned by the late Dr. Darwin; because it promotes putrefaction in a higher degree than any other substance. Hence he observes, that it ought on no account to be *ploughed in*, but simply scattered or sown on the surface of the land, in order that the old grass may be quickly converted into coal, to nourish the young vegetables.

7. *Lime* is another article in the mineral kingdom which is of extensive utility for manuring lands, both in its native state, and also after it has been burnt. Its effects, however, vary greatly, according to the nature and quality of the substances with which it is combined; for where magnesia is in union with the calcareous matter (and limestone of this description is found chiefly in the counties of Derby, Northumberland, and Nottingham,) its beneficial effects are by no means so great in fertilizing the soil, and consequently in promoting vegetation, as where such combination does not exist, particularly when the *same* quantities are spread on land*.

On this account, therefore, as well as on account of the siliceous or sandy particles that are sometimes found in union with limestone, it is most advisable to burn it in a kiln; which is effected by depositing therein alternate strata of turf or coals and limestone, and the kiln being carefully closed, the process of calcination will be completed in about *four* hours. Formerly, indeed, a longer time was allowed for this purpose; but the excellence of

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* For this valuable and interesting discovery, we are indebted to an ingenious essay, by S. Tennant, esq. in the "Philosophical Transactions of the Royal Society," for 1799.
lime as a manure depending on its re-attraction of fixed air from the atmosphere, and it having been found by experiment, that lime burnt four hours has a much greater disposition to recover such fixed air, than that which has been twenty-four hours in combustion, the operation of burning should be regulated accordingly.

The process of calcination will, at the same time, afford a certain criterion by which to judge of its goodness. Thus, if its weight be thereby materially reduced, and the lime-shells be extremely light, requiring much water to slack them fully; if a long time elapse before they begin to fall; if the limestone be not apt to run, or become vitriified during combustion; if it fall entirely, when sufficiently moistened with water, after it has been properly calcined; if, in the operation of slaking, it swell greatly; and, if the lime be light, of a fine white, and fine to the touch; in all these instances, Dr. Anderson observes, that the farmer may rest perfectly satisfied of its goodness, and may use it preferably to any other lime, which may be inferior to it in these respects ("Essays on Agriculture," vol. i). And as lime effervesces with any of the mineral acids, except the sulphuric or vitriolic acid, the facility or difficulty of effervescence, together with a careful inspection of the residuum, will (as the same practical writer has remarked) afford a certain criterion for ascertaining the relative purity or impurity of the different sorts of lime.

Much caution is necessary in the use of native limestone; nor should it, indeed, be ever employed on any soil without duly considering and accurately weighing the nature of the latter. In fact, it will be most advisable to use it in a calcined state in all cases, unless there be a scarcity of fuel for the purpose; and, in such event, it ought to be attenuated as finely as possible, by stamping or bruising to pieces in the best manner of which circumstances will admit.
After the lime has been perfectly calcined, as already intimated, it receives the appellation of quicklime; and ought to be spread as quickly as possible, immediately before the plough, in order that it may be duly slaked and blended with the soil. This fossil is calculated for almost every soil, but more especially on boggy, peaty, swampy, heathy, and mountainous situations; on waste lands which are overrun with fern, broom, bushes, furze, rushes, &c. and which contain a large portion of coarse vegetable matter, though, from the nature of the plants that cover their soil, they have contracted an acidity unfavourable to vegetation; on rich loams abounding with vegetable matter, the general putrescency of which is promoted by the lime, so that such soils prove uncommonly fruitful; on old sheepwalks and commons; and on low, rich, drained meadows, which have formerly been marshes, and which contain a very considerable quantity of vegetable matter. For the lime, in all these cases, uniting with the soils, correct them by accelerating putrefaction, and dissolving or removing thence every thing that is noxious or hurtful to vegetation. But on strong stony lands, or such as are situated upon quarries of lime or other stone; and on stiff, wet loams, which retain moisture, and are not properly drained, lime produces little benefit.

The quantity of lime to be spread on land necessarily varies, according to the influence of local custom; indeed, numerous intelligent agriculturists have used from one to six, and even seven hundred bushels per acre, on different soils, and with various degrees of advantage resulting from this management. Much, however, must depend upon the goodness of the lime, and the nature of the soil to which it is applied. The general allowance, in the estimation of experienced farmers, should be at least three or four hundred bushels an acre, particularly where lands have for a long time been in a neglected and uncultivated
state; in which case, one good application of lime proves more beneficial than the frequent and repeated scattering of small quantities. But Mr. Young thinks that, for common soils, which are not impregnated with acids, or do not abound in putrescible matters, one hundred and sixty bushels will be sufficient for one acre; which quantity, however, he conceives, should be increased in a double or treble proportion in the case of strong and stiff clays.

As lime, when applied without the addition of any other manure, is said to exhaust the soil, it has been suggested to form small heaps, and cover these with earth; when the lime is slaked by the moisture of the soil, the piles or heaps are directed to be opened, and as much dung deposited in each as the earth will cover. A better mode of correcting the too caustic properties of lime is proposed by Mr. Andrews, (in the "Annals of Agriculture," vol. iv.) who directs one hundred and forty loads, each load containing forty bushels, of moist dung to be thrown up into heaps in December, and then to incorporate two hundred bushels of lime. At the end of three months the mass is to be thoroughly stirred; and at the end of harvest, or, if the season should be unfavourable, after the first hard frost that occurs, it may be spread on a pea-stubble, and ploughed in for barley, of which it will produce very luxuriant crops. By this method of treatment, the seeds of weeds usually found in dung will be effectually destroyed, while the increased fermentation, thereby produced, more speedily excites the fertilizing qualities of the dung.

The expence of liming necessarily depends upon the expence of fuel for burning, and the distance of carriage, so that we cannot specify any certain criterion on this point. We shall therefore observe, in addition to the facts already stated, that lime destroys snails, slugs, and other insects, which abound on almost every soil; and though, as already intimated, it may not be proper for clayey lands, yet
OF MANURES.

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it was the opinion of the late Dr. Darwin, that if they were properly mixed with such soils, they would become less cohesive, and consequently be more easily penetrated by vegetable fibres. Lastly, as lime is an excellent corrector of acidity, it is peculiarly calculated for these grass lands, the produce of which is so rank and sour as to be refused by cattle; so that if a handful of lime, for instance, be thrown upon a tussock, or 'spot of long rank grass, that has been rejected for years, cattle will afterwards eat it close to the ground.

8. Marl is a calcareous earth, found in different parts of this island, in various forms, and blended with various substances; according to which it is differently called stone-marl, argillaceous or clay marl, and shell marl. The first is so denominated from its being of a harder consistence than the other sorts, on account of the greater or less quantity of sandy particles it contains; of the second kind clay is a principal ingredient; it is of a grey brown, or reddish-brown tinge, sometimes intermixed with blue and yellow. In shell marl, the chief component is a decomposition of shells, effected in a long course of years, blended with a small portion of earthy matter. The strata, or beds, where this mineral is found, are from two to twelve feet thick, and at various depths below the soil. But all these varieties of genuine marl agree in effervescing with acids, (the best test for examining them), falling in water, crackling in fire like salt, and becoming pulverized on exposure to the atmosphere.

The best season for applying this fossil manure on lands is in the months of January and February: the quantity varies according to the nature of the soil. For sandy, light lands the argillaceous marl is preferable, as the stone and shell marl is best calculated for stiff, clayey, and loamy soils. The average allowance for sandy ground, Mr. Young states to be about fifty or sixty cubical yards
per acre; but on loose, wet loams, (which are greatly benefited by the use of marl), it should be spread to the quantity of 100 yards. Much attention, however, is requisite in this respect, as if too large a proportion be spread at one time there will be a difficulty in removing it; whereas, if too little appear to have been spread, the deficiency may be easily remedied by resorting to frequent light dressings.

On account of the expence attendant on marling land, this mode of manuring is best calculated for inclosed lands, which it has been recommended to lay down with clover, rye-grass, and trefoil, in the spring twelve-months before the application of the marl, and to remain at least six months after it; that it may have time to sink and eat itself into the flag, before it be ploughed up, when there will be little or no danger in losing it, being already in some measure incorporated with the soil. Every attention should also be given to break all the lumps, and get it fine by repeated harrowings and rollings, and having all the stones picked and carried away, in order that the grass may shoot up as soon as possible, that stock may be grazing upon it. So permanent are the fertilizing properties of marl, that if it be properly spread on land, it will continue arable for twelve or fourteen years, and for pasture during a much longer term.

A most successful instance of the beneficial effects resulting from the judicious application of marl, occurs in the "Communications to the Board of Agriculture," vol. ii. Our limits forbidding a detail of the whole process, we shall at present only state, that thirty years since Mr. Rodwell (whom the Board honoured with their gold medal) took a farm of 1400 acres, chiefly poor heath land; during that period he has broken up and manured the land with nearly one hundred and forty thousand large tumbril loads of clay and marl, at the expence of four thousand nine hundred and fifty-eight pounds; his indefatigable exertions have been crowned with great success, so that the
annual rental of his farm has been increased from one hundred and fifty to seven hundred pounds.

Where no marl-pits exist, or this fossil cannot be procured but at an expense by no means commensurate with the benefits that would be derived from it, a good artificial marl may, it is said, be formed by mixing equal parts of lime and pure clay in alternate strata, so as to form a heap, which is to be exposed to the winter frosts. This compost is asserted to be calculated for light lands, and little inferior to the genuine marl; but for strong and heavy soils it will be necessary to mix loam and sand with the lime, in lieu of clay.

9. *Salt* is another fossil manure, of singular utility to pasture lands; on which, when it is properly scattered, cattle thrive very speedily. It is also said to be of great use for raising turnips: besides which, it not only improves and increases the herbage, but also sweetens sour pastures, while it destroys weeds and noxious vermin. The most accurate proportion is sixteen bushels per acre; for if that quantity be exceeded, its beneficial effects will be diminished, and vegetation be completely checked.

10. *Sand* is reputed to be an excellent manure for moorish or swampy lands, in the proportion of 160 loads per acre; and for clayey soils, in the quantity of forty or fifty loads. *Sea-sand* (the farther it is brought from the high-water mark the better) is the best calculated for this purpose; and next, in point of quality, is the sand washed down by heavy showers on gravelly soils: the other light dry sands being liable to be drifted about by every breeze of wind, are of no use whatever. Sand was formerly used to a considerable extent in the southern parts of Devonshire and the West of England; but it has been gradually relinquished, and will probably be soon entirely superseded by *Lime*.

11. *Soot* from coals is preferable to that obtained from
the burning of wood: it answers best on light, dry, chalky soils, and in moderately wet seasons; but produces little benefit on strong, wet, clayey lands, or in very dry seasons, unless it be sown earlier than usual. It succeeds well, when sown on peas and clover, in April; and if thinly distributed on newly-sown turnips just before they come up, it not only destroys insects, but effectually secures them from being affected or injured by the fly or grub; provided no rain falls to wash the soot into the soil. The quantity per acre varies from twenty to forty Winchester bushels; but, where no other manure is used, thirty bushels are reckoned a complete dressing. The expense is from 1l. 10s. to 1l. 16s. per acre, including the cost of the soot, the carriage of it from the metropolis, and the labour of sowing, which is done in the same manner as seed-corn is committed to the ground.

§ 4. Fluid Manures

comprise water, mud, urine, and generally speaking all liquid matters, which are, or may be, profitably converted to the manuring of land.

The best methods of employing water for this purpose have been stated in a former part of this chapter*, as well as the advantages resulting from warping land†. With regard to mud (which term includes the sweepings of streets and roads) rendered fluid by rains, particularly the miry sediment found at the bottom of ponds; it is improbable, as Mr. Young has justly remarked, that pond-mud, especially if there be a stream running into the water, should ever fail of proving a good manure, when used with judgment. The mode of using it, which has been found most advantageous, is as follows.

As soon as the mud is dry, and sufficiently hard to spit, it should be turned over; and, at the end of three or four

* Ante, p. 310, and following.  † P. 336.
weeks afterwards, an equal quantity of chalk or marl is to be mixed with it; the chalk being either carried to the mud, or the reverse, as convenience or other circumstances may require. If lime can be had, at a cheap rate and in abundance, the addition of one-fourth part of lime to the mud will prove of great benefit. The whole must be well incorporated, and continue from June (the usual season for this work) until September, when it should be again turned over, and spread upon pasture or meadow land in October∗.

The best mud for agricultural purposes is that taken from ponds, which have received the draining of farmyards; to which may be added the scourings of old ditches, which chiefly consist of decayed vegetable matter, and the sweepings of London streets; both of these, however, require to be mixed with horse-dung, in order to promote fermentation, before it be spread upon the land. Thus prepared, mud forms an excellent top-dressing for grasslands; but it ought on no account to be spread in too great quantities, or too thickly at one time; otherwise it will retard the growth of grass, and consequently prove detrimental, rather than of service, to the ensuing crop. Ten or twelve loads per acre are said to have been carted on lands with the most beneficial effects.

Urine, or the liquor of farm-yards, is a fluid capable of being employed with great benefit both on meadows and on arable lands, which renders them uncommonly fertile. In the former case, the best time for sprinkling the fluid is during the winter, when the rains will wash the fertilizing saline particles into the soil; or, the land may be sprinkled early in the spring, when it is laid up for hay; because no cattle will touch the grass, so long as the salt adheres to the blade. Another circumstance necessary to be attended to, in order to make the most of this valuable

∗ Farm, Cal. p. 371.
manure, is, that it be carried to the meadow or pasture, intended to be watered, in dry weather, as the farm-yard liquor in the reservoirs is at that time strongly impregnated with salt, which may be known by its deep brown tinge. Thus the reservoirs, or ponds, appropriated for its reception, may be constantly kept in a state of readiness for that purpose; while the land may be watered or sprinkled as often as occasion may render the operation necessary.

§ 5. Compound Manures.

A few years only have elapsed since manures, combined from different materials or substances, have been known to the agricultural world, under the name of *composts*. Of their utility no doubt can exist, since it has been proved by actual experience, that the mixture of such matters as are calculated mutually to act upon each other, and are adapted to the different states of land, are eminently useful in increasing its fertility, as well as accelerating the growth of vegetables.

The best composts are those which are made from a mixture of animal substances with earth. Formerly it was the practice to make composts in *layers*, by which means much of the strength of the manure was necessarily wasted, before it could be spread on the land; it is, however, a more economical method, first to mark out the spot or yard, next to cover its concave bottom four or five inches deep with very tough clay, and then to cover this stratum with strong gravel, well beaten in, to prevent its removal when the manure is taken out. Into this spot should be conveyed a quantity of earth, taken either from the top or under surface, and of a quality adapted to the land to be manured; that is, for compact, stiff, clayey soils, *sand*; and for open, porous, sandy ground, *clay*; it will also be necessary to cut down and collect all the weeds about the farm, before they seed, (to which may be added the deci-
duous leaves of trees), into the yard, where the putrefactive process may be completed by the aid of lime, in the manner already mentioned in § 1 of this section. After thoroughly breaking the several materials, (such as sawdust, offal, bones, waste or refuse fodder, the refuse of blubber after extracting train oil, and in the cyder counties the refuse of apples and pears after making cyder and perry), they may be laid in heaps around the space marked out for the compost heap, a man being placed between each two heaps, to throw the manure spreading upon the space. Thus the compost heap will be shortly raised to the requisite height; and, the various ingredients being thoroughly mixed, the whole will ferment, and in the course of two months will incorporate as fully as the same manures disposed in layers in the common method. It is to be observed, that though autumn is above stated as a proper season for making composts, on account of the weeds and leaves, yet this business may be carried on at other times in the year; but composts, thus prepared, ought not to be prepared too long before they are spread upon the land, as they will waste considerably, and the most fertilizing particles be evaporated.

For composts thus made, one faithful mixing or turning will be fully sufficient; for, as an intelligent American agriculturist (Mr. Bordley) has justly remarked, the frequent turning of composts will weaken them as a manure, by checking the fermentation of the mass. Should, however, such fermentation subside too early, holes may be made in the heaps, from the top nearly to the bottom, with a pole, into which may be thrown urine, or farm-yard liquor; and as the water drains from the heaps, it should be carefully collected and thrown upon them. As it must frequently happen, that this part of the business cannot be done precisely at the time when the water has so drained

* Farm. Cal. p. 98.
off, from the farmer being necessarily occupied in attending
other matters, wooden troughs, or gutters paved with
gravel well pounded, or with lime and gravel mixed with
boiling hot lime-wash, and spread with a trowel, may be ad-
vantageously made, for the purpose of conveying the li-
quor to a tight barrel, or hogshead, in the ground, whence
it may be thrown upon the heap at a leisure time; and con-
sequently the fertilizing liquor will be prevented from
losing its properties by evaporation.

Such a compost, it is observed, may be made to suit
any kind of soil, by duly apportioning the ingredients; and
is peculiarly excellent for meadow or pasture grounds.
But where these lie at a considerable distance, or the earth in-
tended to be mixed with the compost must be brought from a
considerable distance, much time and expence of carriage
may be saved, by making a compost heap on the headlands
of the fields intended to be manured. The best situation
for this purpose is upon level ground; or, if it be unavoid-
ably upon a descent, a trench should be cut on the lower
side to receive the oozing, or running, from the heap,
which may be occasionally thrown upon it in the manner
already mentioned. The proportion of compost allowed
to each acre may be calculated at from sixteen to nineteen
or twenty loads, each load containing from one ton and a
half to eighteen hundred weight; though the nature of the
soil, and other circumstances, may require either a smaller
or a larger quantity.

§ 6. Preservation of Manures.

As manures are of such indispensible necessity to the
farmer, and dung is in general so important a manure,
every possible method should be taken, not only to prevent
it from being wasted, but also to improve it both in quality
and in quantity. In no way are manures more wasted, than by
too great exposure to the sun, air, and rains; hence various
expedients have been resorted to, in order to prevent this loss. Such, for instance, are the mixing of dry earth, or other absorbent substances, which certainly will, in a great measure, prevent this inconvenience; the erection of slight sheds over dung-heaps with the same intention; the covering of these heaps with turf sods (the grassy side being downwards), when the dung is to be kept till it be old; and by no means bad practices, as the turfs will, in the course of time, be converted into excellent manure.

The farm-yard is doubtless the most proper and convenient place for forming dungsteads, or dungmeers, as the repositories for this useful article are variously termed. For middle-sized farms one will suffice: for larger farms two or more will be necessary, for the proper management of dung. According to the usual practice, a pit is dug sufficiently deep to hold the soil which the farm may require; and into this are thrown waste fodder, fern, straw, leaves, coarse grasses, thistles, rushes, flags, and similar aquatic plants; litter, scrapings of the yard after rain, sweepings of the kitchen, bones, ashes, shells, woollen rags, weeds, &c. which lie there and rot, until they are wanted for use. It has, however, been suggested by the late Dr. Darwin, to dispose the heap of dung on a gently-rising eminence, with a basin beneath, for collecting the superfluous water that may ooze from the heap. We would add, that if a shady spot cannot be obtained for this purpose, a slight shed should be thrown over the dungstead, to prevent too much exposure to the sun, air, and rain; and that gutters should be so contrived, that all the waste water and urine of the yard, oil-dregs, greasy water, bloody water in which meat or fish has been washed, old useless brine, the suds and waste water of the farm-house—in short, every possible kind of liquid that may be useful—may flow through them into the reservoir, or basin, and be preserved. Dr. D. farther states (in his "Phytologia"), that some earth, weeds, saw-dust,
offals, or other vegetable or animal excrement, should be thrown into such reservoir; which will, in consequence, promote the fermentation and putrefaction of the substances therein contained, at the same time that the draining from the dung-heap will not be dissipated.

The necessary depots for manure being thus prepared, it will only remain for the farmer to avail himself of every possible matter, both in the vegetable and animal kingdom, for increasing and improving its quantity and quality. In addition to the various articles enumerated in the preceding paragraphs, we would observe, that before the winter or foddering season commences, the surface of the cattle-yard may be raised by spreading thereon dry swamp-mud, pond-mud, the dry scrapings of roads or ditches, and similar matters that can be procured. On this stratum may be spread a little lime, for the more speedily accelerating the decomposition of the litter, fern, and other tough vegetables that may be thrown upon it for that purpose; and, in case the season should prove too dry, the decay of the vegetable matters may be promoted by sprinkling them occasionally with water from the pump, or (which is preferable) with some of the liquor from the reservoirs at the bottom of the dungsteads. Every previous arrangement being thus made, the cattle ought to be kept within their yards throughout the winter season: where they are numerous, the surface of the yards may be removed to the dungmeers, and laid down afresh in the manner above mentioned.

With regard to the increasing the quantity of manures, agriculturists are by no means agreed as to the point of allowing litter for their beasts to lie on, or of consuming their whole stock of hay and straw, and placing the floors in such a direction, that they may be kept clean by sweeping only, so as to render litter of any sort unnecessary. The latter practice was adopted by the late eminent breeder, Mr. Bakewell, is sanctioned by many eminent farmers, and, it
is obvious, must produce the largest quantity of animal manure, from the straw and coarse food being consumed by lean beasts, while the richer and more succulent is eaten by the fattening beasts, whether neat cattle, sheep, or lambs. Both practices, however, may perhaps be united with advantage, where the surface of the yard can be raised in the manner above mentioned.

The augmentation of manure necessarily increases in proportion to the nature of their food. In Chap. III. p. 98, of this work we have pointed out the various articles of the vegetable kingdom that are best calculated for feeding and fattening cattle; and, we trust, have fully evinced the superiority of soiling, both as it respects the economical consumption of food, and also the production of manure. The quantity of manure, afforded by a farm, may likewise be materially increased by having standing sheep-folds (ante, p. 153), and especially by adopting the Flemish practice of keeping them beneath covered folds. For this purpose, in Flanders, the ground is marked out, and spread with dry sand, four or five inches thick; on this are erected slight sheds, in which the sheep are housed at night, a small quantity of fresh sand (for which dry peat, or any of the earthy materials above stated, may be substituted) being laid on every evening. This is cleared out once a week, and carried to a dung-hill, or spread upon the soil. The manure thus produced is admirably calculated, in the opinion of M. Quintinie, for fertilizing almost every kind of ground, and in fact makes an excellent dressing for cold and stiff soils.

The most effectual method of raising a supply of manure for land, (especially in counties that are situated at a distance from the metropolis, so that they cannot be thence supplied with dung, &c.), in Mr. Middleton’s opinion ("Transactions of the Society for the Encouragement of Arts, &c." vol. xvii.), consists in raising green crops for the
purpose of feeding sheep, bullocks, or other animals on the land. "For," says he, "this is the only method by which the loss of nearly all their urine and dung, that unavoidably occurs under other systems of management, can be prevented; as there is a great waste, perhaps of half (including dung and urine), in the stables, cow-sheds, fold-yards, and dung-hills, even under the best management. Under ordinary management, three parts of this manure are lost; but in the soilings of tares, turnips, cole, clover, &c. in the fields, there is no loss: the whole is immediately applied, without the cost of carriage, to the enriching of the soil."

It is obvious, however, that much of the ameliorating properties of these manures must necessarily be lost by evaporation, and otherwise be materially diminished; so that, although (as in the county of Norfolk) the soilings of sheep with turnips may be carried on with great advantage on light lands; yet, upon the fullest view we can give the subject, we are decidedly convinced that, under proper management, stall-feeding in summer with green, and in winter with dry food, is the most effectual mode of obtaining the largest possible quantity of animal manure.

In a former part of this chapter (p. 346), the effects of human ordure, as a manure, have been stated; and as, according to the present method of managing it, much valuable fertilizing matter is inevitably lost, it has been suggested ("Communications to the Board of Agriculture," vol. i.) to form reservoirs or pits, with floors of clay, or other material, "impervious to liquid matter, as nearly as possible to the dung-heaps; and to connect such reservoirs to the privies by means of proper drains, furnishing them with covers, for the purpose of throwing in occasionally lime, peat, vegetable recrements, and other substances, that might be removed thence when they should be thoroughly impregnated and reduced to putrefaction, and be mixed with
the common dung-heaps. In large towns and cities, where immense quantities of this kind of manure are annually produced, it is recommended to construct such reservoirs or basins with similar floors and drains, but upon a larger scale, so that their contents may be removed as often as necessary during the night. Or, where large rivers flow through cities or towns, &c., reservoirs of this description might be formed on their banks, and the ordure be thence conveyed into covered boats or barges; or this manure might probably be conducted, through the medium of sluices, from the extremities of the common sewers into such barges, and be easily transported to distant places. And, as the system of canal navigation is now brought to so high a degree of perfection, the expense of carriage will be trifling indeed.

Dung-steads may be tended, and the respective manure augmented at different times, when no other business of greater moment stands in the way; and, to prevent the heaps from being too much torn or spread about by the scratching of poultry, or by swine, they should be surrounded by pens, made of broad deals. In wet seasons it will be advisable to throw a slight shed over the dung-steads; and, as the heaps will not ferment so expeditiously as could be wished, it may be useful to turn them over once or twice in the course of the summer; thus they will become more thoroughly mixed and mellowed, and rendered sooner fit for use, while the seeds of weeds therein contained will vegetate, and be destroyed.

The following method of making dung-hills, as practised in Middlesex, we give from Mr. Middleton's interesting Agricultural Survey of that county; and, from its judicious arrangement, it has a just claim to the attention of agriculturists.—In the first place, all the scrapings of roads, mud of ditches and ponds, and the top mould of gravel-pits are spread in the most convenient spots, as
bottoms for dung-hills; on these layers is carted all the dung produced on the farm, together with the whole of what can be obtained from London, and the various inns on the road; to which materials are occasionally added chalk, ashes, soap-boilers' waste, bricklayers' rubbish, &c. In this state the mass, or heap, continues till within one month of the time for manuring land; the whole is then turned, and thoroughly mixed together, the larger clods being broken into small pieces, and the drier parts being thrown into the middle. In consequence of this management, the mass becomes more intimately blended, and the putrefactive process is completely finished, while the matters remain in a heap. At the same time, by this method of forming the bases of dung-hills, the fertilizing liquor which distils during the fermentation and heat that necessarily ensue, is effectually preserved, and greatly contributes to ameliorate the soil.

§ 5. On the application of Manures.

As manure is essentially necessary to the improvement of land, and to promote the growth of plants; while its fermentation and warmth dispose the soil for the more easy admission of moisture from the atmosphere, and thus ultimately contributes to the support of human existence; the mode of applying it to the greatest advantage is a subject every way deserving of attention. In the preceding discussion of the various articles capable of being employed for this purpose, some hints as to their general application have necessarily occurred; but, beside these, there are other circumstances to be regarded, viz. the crop—whether tillage or grass—the nature of the land whereon the manure is to be spread, and the state of such manure at the time it is to be employed: on these points we now proceed to state some remarks derived from the experience of the most intelligent agriculturists.
With regard to the state in which manures are to be spread on the land, it appears, that those soils, which are intended for the production of crops that speedily attain their full growth, derive the greatest benefit from the application of such manures as are thoroughly reduced by the completion of the putrefactive process; of this description are grass-lands and meadows. On the contrary, where vegetable crops are longer, both in point of duration and also before they arrive at maturity, those sorts of dung, or manure, which have undergone the least change or decomposition, are most beneficial; to this class belong tillage-lands in general, especially stiff clayey soils. And hence it has been found, that the turning in of green crops for this purpose is a very beneficial practice. Lord Kaimes*, indeed, disapproves of ploughing down buck-wheat, clover, or any other crop for manure; and conceives the best way of converting a crop into manure, to be by passing it through the body of an animal, as the dung and urine (to omit the profit of feeding) will enrich the ground more than ploughing in the crop. This opinion is supported by many respectable agriculturists; while others, equally intelligent and equally respectable, have urged the benefit resulting from this practice. Such a difference of opinion can only be accounted for by the difference of soil, situation, and circumstances under which they must of necessity have been. But, as we have already stated (§ 1. p. 346.) the best time for this purpose, we shall at present remark, that all vegetable crops, intended to be employed as a manure, ought to be carefully turned in with a skim-couler plough, in order that it may be thoroughly concealed from the eye.

In regard to the time, or season, for manuring land, whether it be spread simply upon the surface, or ploughed down into the soil, it is difficult to state the precise period; because the peculiar convenience of the agriculturist, to-

* Gentleman Farmer, p. 258.
gether with the condition of the land, must always influence his practice. In general, however, the following points will afford a criterion by which to regulate the application of manure.

I. The land should be dry, in order that it may be fit for the reception and retention of the unctuous parts of the manure; although this circumstance may admit of a slight variation. Thus, in the case of grass or meadow-lands, which require the manure only to be strewed, or spread, on the surface of the soil, it will be best to apply it a short time before the grass, &c. shoots upwards from the ground. On the contrary, where it is deposited in the earth, the most proper time will be immediately before sowing the seeds, for whose nutriment the manure is destined to serve; because, as Dr. Darwin excellently remarks, the atmospheric air that is buried with the dung, in consequence of its union with the carbon in the cavities or interstices of the earth, gradually evolves a genial warmth, which greatly accelerates vegetation.

II. The manure ought to be spread without delay, (in fact as soon as may be practicable after it has been carried to the field), and dispersed as equally as possible. For this purpose, the labourers and implements should be ready on the spot. Mr. Bordley directs the loads to be regularly arranged in lengths, or rows, and the dung or compost to be immediately turned in, "line by line;" as it more readily dissolves in the ground when newly covered, and its whole strength is thus secured to the soil.

III. Farther, the manure should be speedily mixed with the earth, and buried at a proper depth, lest the oily and nutritious particles should evolve and be dissipated. On the coarser soils, therefore, from three to four
inches would be a sufficient depth; though the manure may be set much deeper in the more porous and friable sorts of land.

From these remarks then it appears, that autumn is in general the fittest season for depositing manure, the earth being then sufficiently dry for the purpose; though the farmer may, in many cases, as above intimated, successfully deviate from the regular practice. In order, however, to prevent an undue evaporation from taking place in hot weather, some caution should be observed, that the strength of dung be not diminished by carting out more from the dung-stead than can be properly dispersed shortly afterwards, or by shovelling it more than is absolutely necessary, in hot, windy, or dry seasons. On the contrary, if this business be performed in calm, serene, or in cloudy weather, the volatile parts of the manure will not evaporate in any considerable degree. Farther, when the farmer has carted away his dung-heaps from his yards, he should take up an inch or two of the surface ground beneath, unless it be rendered impenetrable to moisture; because, ordinarily, much of the strength of the dung and urine has passed into it, and made it a good manure.

IV. The manure ought to be invariably proportioned to the nature of the soil; because if too much dung be laid on a warm and light soil, it imparts to the latter a still greater degree of heat, which in a measure burns up vegetables; and, on strong soils, too large a quantity will make the plants shoot up with too much luxuriance, in which case they rarely attain to perfect maturity.

In the former part of this section, the various natures of the different sorts of manures, together with the soils to
which they were peculiarly applicable, have been stated, so that little perhaps can be said in addition on this head. In order, however, that manures may be duly proportioned to the soil, it may not be useless briefly to recapitulate:

1. That the wetter, and consequently the colder, lands are, the more dung they require; because their cold nature should be corrected by the warmth of the dung.

2. On the contrary, a less proportion of dung will be sufficient for drier soils, lest the too great heat should burn up the plants.

3. For cold, stiff, loamy clays, which are liable to become too solid and impenetrable to the fibres of vegetables, the manure ought to be employed before it be perfectly decomposed, as it will thus prevent the surface from becoming too solid and firm; and notwithstanding, as Dr. Darwin has remarked, the putrefaction will in some degree be retarded, yet the fertilizing substances will, at length, totally decay, and afford to the roots an equal, though more gradual supply of nutriment.

4. Vegetable earth or mould being, in general, of a drier nature than the preceding sort of soil, does not require so large a quantity of dung.

5. Sandy lands being naturally hot, and superficially covered with a still hotter layer or stratum, require dung that is perfectly decomposed and putrified; though, indeed, manures in an imperfect state of decomposition may be applied, they should, however, be laid on in smaller quantities at one time, and oftener. And as such soils are, in some districts, greatly improved by folding, the dung thus applied should be mixed with the soil by the plough or harrow, or with the hoe or shovel, every two or three days, if the
OF MANURES.

weather be dry; in cloudy or rainy weather, it will not require to be so frequently mixed. By pursuing this method, much will be saved; and half the time that fields are commonly folded will, probably, be sufficient to enable them to yield a good crop.

With regard to the manures which are spread on the surface of grass-lands as top-dressings, the proper season for laying on the coal-ashes, soot, lime, wood-ashes, malt-dust, &c. usually employed for this purpose is, as early in the spring (in February) as may be conveniently practicable; for, in general, those articles are spread in too small proportions to require a whole winter's rains to wash them into the soil; whereas, by dispersing them over the soil in a state of coarse powder, or in small lumps that cohere but slightly, the vernal showers will wash them into the soil, so that the stems of young grass may easily shoot upward through the ground. But, where a second harvest of hay is to be made, and the weather is not too hot, another top-dressing of perfectly-reduced manure may be applied, with considerable benefit, to the crop.

Grass-lands may be much ameliorated, both in the improvement of the herbage, and also in the amount of the produce, by cutting them five or six inches deep with a five-couler cutting-plough, or scarificator, that cuts the surface in slips four or five inches asunder, but without raising or turning them. It is the sinking of the manure into these incisions, which effects the improvement just mentioned; and which advantage is greater than if the manure were first applied, and the cutting then took place; and both are, in the opinion of Mr. Young, superior to the practice of manuring without cutting, as has been abundantly proved by experiments. It may, however, be remarked, that this system of cutting, though applicable with equal success and benefit to clayey grounds, loams,
and gravels, is not capable of being employed with effect upon very strong grounds, abounding with stones, as the coulters are liable to be thrown out of work by the stones and similar obstructions.

After the grass is mown, some farmers give the land a dressing of dung, usually in September; but this operation ought not to be deferred beyond October. Where composts are used, the end of September Mr. Y. thinks to be the best season for using them; the proper quantity is about fifteen or twenty cubic yards per acre, every fourth year, unless the pastures be very rich; a pound of common salt being always mixed with each cubic yard of compost in turning over.

In a preceding page, the practice of ploughing in manures a short time before the grasses begin to shoot, or the seeds of other vegetables are deposited in the ground, has been mentioned as conducing to promote their respective growth. There is, however, another advantage resulting from this mode of manuring land, viz. that the whole is thus made to nourish the vegetables in an immediate and direct manner, a smaller quantity will be fully adequate for this purpose. Farther, as the collecting, preserving, and augmenting of manures is necessarily attended with considerable expence, it certainly behoves every intelligent agriculturist to employ it in the most economical way. This object is stated to be, in a very great measure, attainable by adopting the drill husbandry, one principal advantage of which consists in depositing the manure in drills. Mr. Parkinson ("Experienced Farmer," vol. i. p. 32.) observes, that such drills should be made two feet asunder, each being six inches wide at the bottom; thus he sows peas, beans, &c. from the result of which he asserts, that in consequence of the manure being thus kept closely together, and the seeds being placed immediately upon it, four loads will perform, in the drill husbandry, as fully and as bene-
ficially what would have required sixteen loads in the usual way of spreading it over the land.

SECTION IV.

Of Fences.

Fences, in rural economy, comprehend, in general, every sort of inclosure that is employed for shelter, or to protect the lands inclosed from the intrusions of cattle. They are of various sorts, and formed of various materials, according to the peculiar circumstances of situation, &c. At present we consider those peculiarly belonging to a farm, and which may be classed under the heads of banks or walls, hedges, ditches, and gates.

I. Earth banks are chiefly employed in those districts where other materials for constructing fences are difficult to be procured. The best mode of forming such banks is, to dig up some turfs in a spot abounding with grass, about one spit deep, and four or five inches in thickness. These should be laid even on one side by a line, with the grass outwards; and on the back of these is to be placed another row of turf, leaving a space of one foot of solid ground on the outside, in order to prevent the bank from slipping or falling in, in case any part of it should be deficient. On the outside of this is to be excavated a ditch, otherwise it will be necessary to make both sides with a slope two feet deep; but this will not materially affect the fence, as both sides will produce pasture. The earth which is dug out of the ditches, or from the slopes, ought to be thrown in between the two rows of turf, till the whole is made level in the same manner, and the bank becomes four, five, or more feet in height, the width of the foundation being at the same time increased according to the width of the bank. In proportion as the bank ascends, the two
sides must be made gradually to slope, so that the top shall be about two feet and a half wide. It should, however, be uniformly regarded, in forming earth-banks, that they never be constructed or raised in dry weather; for, in the event of sudden or long-continued rains descending, the soil between the sods would swell and bulge out, and of course materially affect, if not totally destroy, the solidity as well as the symmetry of the banks. The top may be planted with quick, or any of the other shrubs useful for fencing, which will be stated in the course of this section.

II. Walls are the most usual kind of fence in those districts which abound with stones: when well constructed, they are of great durability. The fossil used for this purpose may be lime-stone, rag-stone, or grit-stone, or any other kind that is most convenient; though lime and grit are preferable to other, on account of their being in greatest abundance, and most easily wrought. Walls are either made with stones only, in which case they are termed dry stone walls; or with stones and earth intermixed, when they are called earth and stone-walls; or with lime and mortar, in which state they are denominated lime and stone-walls: the last mentioned, though possibly more expensive in the first instance, are ultimately the most durable, and consequently the best adapted for fences.

In constructing stone walls, the foundation ought to be about two feet and a half in width, the wall tapering upwards to ten inches or a foot, and thence to fifteen or twenty inches. The foundation should be placed at such a depth in the ground as to be totally unaffected by frosts; the wall should be carried up to the height of six feet, and coped at the top with stones placed edgeway; and where dung is laid against it, the height ought to be still greater, in order that the coping may be out of the reach of the stock. Where lime cannot be procured to cement the stones together, a dry wall may be constructed in the same manner.
which, if judiciously arranged, will last nearly as long. And, as soon as the wall is completed, a ditch should be dug on each side, from eighteen to twenty-four inches in depth, at the distance of about one foot from the root or foundation of the wall, which will not only be thus kept dry, but will also contribute to the security and durability of the fence, by preventing cattle from approaching too near to the wall.

III. Hedges constitute another useful kind of fence, especially in those situations where no materials for walls can be obtained. They are usually formed by intertwining the branches of trees, and are commonly distinguished, 1. Into those intended for the protection and ornament of gardens: and 2. Into outward fences, or hedges, which are employed for sheltering and defending fields. In forming hedges of the last-mentioned description, with which we are chiefly interested, every attention should be given to have the plants as nearly as possible of the same size; although the nature of these will necessarily vary according to the quality of the soil. Thus, for wet or swampy places, that are liable to sudden inundations, the alder, willow, (or preferably to this the white-thorn), and osier may be beneficially employed: on dry, sandy situations furze may be made use of with great advantage, if it be planted at a proper time and be managed with care. For this purpose a bank should be raised, five or six feet broad at the top, with a proper ditch on each side, the surface of which is to be thickly sown with furze seeds. These will speedily vegetate, and in the course of two or three years will form a fence that will continue for several years, and resist the efforts of most animals. As, however, the furze increases in size, the old prickles will decay, and consequently leave the lower parts of the stems exposed, so as to afford an entrance to cattle; this inconvenience can only be remedied, or rather prevented, by gradually supplying the bank with
new plants, which should not be permitted to shoot up to such a height as to leave the lower parts naked; thus, if one side of the hedge be cut down close to the bank, the other half will continue as a fence; till the former part attains a proper size, when the opposite side may be cut down in a similar manner; so that the bank will always have a strong hedge upon it, without being liable to become bare at the roots.

Among the plants which have been recommended for putting into hedges are the following:—1. The **black-thorn**, the growth of which is less certain than that of the **white-thorn**; though the bushes of the former are superior to those of the latter for mending dead hedges, being less liable to be cropped by cattle. 2. The **white-thorn**, which grows very rapidly, is very durable, and will flourish in almost any situation, except gravelly soils: they are best calculated for this purpose when about one or two years old, and should be transplanted from a rich, fertile nursery. 3. The **holly**, though slow and less certain in growth, is said to be superior to either of the former plants for making quickset hedges; and by its thickness, height, and strength, fully compensates for the delay and expence incurred.

The best mode of making hedges with these trees is, first to mark out the line of ground, and, by ploughing or digging, prepare it for the purpose; the young plants, having been carefully removed so as not to hurt or injure their roots, are then to be placed in the ground, in the proportion of four or five quick or white-thorns to one holly. Both will flourish; and as the hollies increase in size, the thorns may be pulled up, and when the former have attained their full growth, they will occupy the whole space, and form a most permanent fence. Should any intervals occur, they may be easily filled up by bending down the lower branches, and covering them with earth; in the following year these will take root, and shoot forth so as to present an impene-
trable barrier. It is well known, that white-thorns do not flourish to advantage on dry, gravelly, thin soils: the reasons assigned for this circumstance by Mr. Leatham (in an interesting communication inserted in the "Transactions of the Society of Arts," vol. iii.) are, 1. That they are set too low or too flat on the surface to allow the roots to strike deeply into the soil. And, 2. When planted higher, they are generally too near the slope of the bank, so that they cannot receive any benefit from the rain. The remedy he proposes for these inconveniencies is, to make out two lines, twelve feet asunder, and to take the upper part of the soil from three feet within each line, and to throw it into the centre of each space, so as to form a flat bed three feet broad; in the middle of this are the quicks to be planted, and the remaining space of one foot and a half is to be filled up with the earth or soil taken out of the ditches on both sides; so that the bed is extended to five feet, allowing six inches for the slope of the bank. Quicks thus planted will meet with sufficient nutriment in the soil, before the tap-roots reach the barren gravelly bottom, and the earth thus placed will retain sufficient moisture to nourish the plants, which will in a short time form an excellent fence. Mr. L. states, that by elevating the bank on each side, at pleasure, the thorns may be protected at a small expence from the ill effects of sharp winds, or sea air; and the benefit resulting from such kinds of hedges more than compensates the expence of making them. At the time he communicated his remarks to the society above mentioned, a rod (fifteen yards) of fence, made in the manner already stated, cost him 1s. 3d.

In addition to the plants which have been recommend-
ed for constructing fences, may be noticed the horn-beam tree, which is chiefly used on the continent; is propagated from slips or sets, and will thrive admirably well on poor, barren, and exposed lands. The slips, or layers, are
planted on an earthen parapet, with a ditch on each side, in such a manner that every two plants may intersect each other; the bark is then scraped off the spot where they meet, which is covered with bands of straw: thus the two plants become united, and put out horizontal, slanting shoots, forming a very strong palisade, which, if carefully lopped or shorn every year, will render the whole hedge utterly impenetrable to men and animals. The *elms* has likewise been brought forward to public notice, as being calculated for fences: when elm timber is felled in the spring, the chips made in trimming the trees are to be sown on a piece of newly-ploughed land, and harrowed in. Every chip which has an eye or bud will speedily shoot, like the cuttings of potatoes; and as elms have no tap-roots, but strike their fibres *horizontally* in the soil, they will be more vigorous, and may be more easily transplanted than if they had been raised from seeds. Another advantage stated to result from this method is, that the same chip or bud will produce five or six stems; and, after being cut down to within three or four inches of the ground, the lateral or side shoots will proportionably increase, and form a thick edge without running to wood; and if they are carefully clipped every third or fourth year, they are said to become almost impervious to any cattle whatever*.

Farther, beech and birch trees are said to form, with proper care and attention, excellent fences, and in a short space of time, in very elevated and exposed lands; it has also been suggested, that great advantage may be derived by planting cyder fruit-trees (*"Letters, &c."* vol. ii.); as the profit they then would yield, would amply counterbalance the expence incurred in rearing them without losing any ground, as the uncommon acidity of the best fruit, at the

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*"Letters and Papers of the Bath and West of England Society,"* vol. i.
time of gathering, will effectually secure them from depredations.

The proper season for hedging is in the autumnal quarter, whence it may be continued through the winter, as opportunity may allow, or circumstances may require. Mr. Young very judiciously advises the farmer to get his fences into good order during the three first winters of his lease; and afterwards to divide them into twelve portions, one of which may be done every year, which will bring the whole into regular cuttings. It is, however, an erroneous, though common practice, to cut thorn hedges every year; for, though it confessedly promotes the beauty of the fence as it respects appearance, yet this beauty is attained at the expense of strength and durability; inasmuch as the stems are impeded in their growth, and become small and weak. On the contrary, if they be carefully lopped or clipped, every seventh or eighth year, with a sharp pair of shears, in a sloping direction on both sides, from the bottom to the top, there will not only be a very material diminution in the labour, but the hedges will also become more close and vigorous, and will, in succeeding years, only require the most prurient lateral branches to be shorn off in the manner above directed. The proper season for this purpose is in the autumn, when the circulation of the sap is less vigorous, and consequently the plants will not suffer materially from the loss of their sap.

The growth and durability of quickset-hedges may be materially promoted by plashing them, an operation which is performed in the following manner. In the first place, the labourers clear the old hedge of all dead or decayed wood, brambles, and other irregular growing rubbish; leaving along the top of the bank the best and straightest stems of elm, thorns, beech, &c. in the ratio of five or six to one yard; though if there be any gaps, or spots, which are thin of live wood, a larger number is left on each side of
such spots. Next they repair the ditch, all the earth arising from which must be thrown on the bank, and by no means laid on the brow of the ditch, unless the ditch-earth happen to be extraordinarily rich, and will pay well for the expense of carrying it to the land; otherwise the grass of the border will be spoiled, and an unnecessary charge be incurred. The ditch being thus completed, the men commence their labours upon the hedge. Such of the stems left in cutting the old hedge, as they find growing in the line where the new hedge is to run, they cut off three feet from the top of the bank, in order to serve as hedge-stakes to the new hedge. This practice, observes Mr. Young, (Farm. Cal. p. 26.), cannot be too much commended; for these stakes being immoveable, and never rotting, keep up the new hedge; so that it never falls or leans either way. In the next place, they drive in the dead hedge-stakes where it is necessary, chusing sallows or willows, that they may grow. The hedgers then plash down the remainder of the live wood left standing; they cut the stick twice, once near the ground, and again about ten or twelve inches higher, and just deep enough to slit out part of the wood between the two; leaving the stem supported by little more than the bank, or about a quarter of its first size. It is then laid along the top of the bank, and woven among the hedge-stakes: in this manner the whole are treated; and where the plants are not sufficiently thick to finish the hedge, dead thorns are interwoven, and the top of the hedge is eddered in the common method.

The fence thus made consists of a good ditch, and of a hedge, of which the principal parts are alive; a point of the greatest importance, as such management ensures a lasting fence; whereas hedges, that are entirely dead, rot in a short time, and fall into the ditch.

The business of plashing hedges is sometimes performed in October, but more generally towards the end of
January, in February, or in March: this latter season is the most advantageous, as the plants, which have been divided or cut during the operation, will be less susceptible of injury from the vernal frosts.

IV. Ditches are cut with various intentions, either to serve as drains, or for fences, or alike for both purposes. Ditches are generally allowed six feet in width, where they are at the side of highways, and five feet in commons. Those which are made or repaired at the feet of banks on which quickset-hedges are raised, Mr. Young advises to be in no case less than three feet by two and a half, and six inches wide at bottom, in the driest soils; but in all wet or moist ones, never less than four by three, and one at bottom. Thus each side acquires a slope, which is of great advantage, and indispensably necessary; for, when ditches are cut perpendicularly, the sides are continually washing down. Whatever be their purpose, whether for drainage or for fencing, ditches ought to be so constructed, that the water they contain may never become stagnant, but pass off into a contiguous rivulet, or brook; they should likewise be occasionally cleaned out, and the mud thus obtained will defray the expence of the additional labour; as it will, when mixed with other matters, form a useful compost for manuring lands.

V. Gates are of various forms and denominations, according to the manner and materials of which they are made. The wood usually employed for this purpose is oak, ash, beech, and other solid timber; though the Dutch willow, and some lighter kinds of wood may be beneficially converted to the same purpose. In constructing gates, the chief points to be attended to are, the fixing of the post so as to resist the attacks that are often made by the forcible swinging of the gate, and the hanging of the gate itself, so that it may shut easily and truly without dragging on the ground.
With regard to the gate-post, where timber is used, it ought to be either prepared by tar, pitch, or oil-paint, in that part which is intended to be deposited (and such posts should always be fixed firmly and deeply) in the earth, or by charring. Stone gate-posts, however, are preferable, where they can be conveniently had; yet, even these are liable to be materially injured by the frequent shaking, or swinging, of heavy gates against them; or, by careless drivers running the axle of their carts against them. To prevent such inconveniences, Lord Kaimes suggests, instead of building a wall or post in the line of the inclosure, to erect it perpendicular to it, seven or eight feet in length, thickest in the middle, and tapering towards the ends; and is of opinion, that such a post will resist any force whatever.

For convenience, in point of size, and security to the farmer, *five-barred* gates, properly braced, are, perhaps, preferable to any others: the dimensions of such a gate should be from eight to eight and a half, or nine, feet in width or length, and from four to four and a half, or five, feet high; the bars should be strong, and three inches and a half deep, and the lower ones so arranged as to prevent small cattle from squeezing through them into the field. The common gates are usually hung on hooks and thimbles, and fastened with latches or catches, without regarding the adjustment or proportions of the whole, with regard to their tendency or difficulty in shutting. With a view to remedy this inconvenience, it has been suggested, in the "Agricultural Survey of the County of Northumberland," after perpendicularly fixing the hanging post on the ground, to draw a plumb-line upon it. On this line, at a suitable height from the top, is to be placed a hook, so as to project three inches and a half; and at a proper distance below this, another hook is to be put, one inch and a half to one side of the perpendicular line, and so as to
project two inches from the face of the post. The top loop, or eye, is next to be placed two inches from the haw-tree, and the bottom loop three inches and a half from it. Gates hung upon this principle are said to possess a sufficient fall, in every situation, and will shut without any difficulty.

SECTION V.

Culture and Management of Grass-Lands.

This branch of rural economy, which, to a grazier, is by far the most important, may be considered under the respective heads of pasture, or that which is exclusively appropriated to the feeding of cattle; and meadow, or hay-lands, which, as the name implies, are chiefly reserved for making hay.

§ 1. Pasture.

The nature and excellence of pastures depend greatly upon situation, and the different classes of animals for whose use they are intended. Thus uplands, or such lands as are considerably more elevated and dry, will be found most beneficial for feeding sheep; while neat cattle may be fattened to the greatest advantage in those which are lower, in point of situation, as well as more inclosed. Farther, it has been found that the older pastures are best calculated for feeding or fattening stock, while new lays (that is, such as have not long been laid down for pasture) are more fitted for feeding young store cattle; and that the size or extent of the inclosure likewise influences the application of pastures.

In laying out pastures then, the first step to be taken is, the division of the land into fields or inclosures, which may contain four, five, six, or more acres; but, in general,
it may be remarked, that the larger or more extensive inclosures are less adapted for feeding, than fields of a moderate size: next, the whole ought to be fenced with good hedges, of such a height that cattle cannot easily overleap them, so that they can feed more leisurely, as well as more securely; and it is recommended to plant timber-trees at proper distances, in order to afford a shelter from tempestuous winds. But much caution is necessary, not to make the inclosure too small, especially when the hedge-rows are to be planted with timber-trees; because the grass will become sour if these are disposed too closely together, and consequently will greatly injure the pasture.

Pastures, like other grass-lands, are liable to be infested with weeds as well as with ant-hills, mole-hills, and other obstructions to the plough and scythe; the former ought to be carefully eradicated towards the end of summer, before the seed-lobes are formed; and, when sufficiently dry, they may be burnt, and their ashes spread on the land previously to the falling of autumnal showers. All mole and ant-hills should be pared off with the plough, and burnt, and their ashes spread on the earth.

Nothing improves pasture land more than a judicious top-dressing; although it must be observed, little comparative regard is, in general, bestowed on this subject. Thus, if the land has not been limed, a good liming, either of that fossil in its natural state, or in the form of a compost, will be found of very great service: marl, well-rotted dung, or the compost already mentioned*, may be spread in like manner, regularly over the soil. The folding of sheep on pastures, while they are fed or fattened with other succulent food, will prove of essential advantage; because the dung thus dropped will be both richer

* Ante, Section on compound Manures.
in point of quality, and more in point of quantity, than it could possibly be, if they were fed or pastured on grass alone, without the aid of any other food. At the same time the sheep will contribute partially to check the too-luxuriant growth of the grass, which will consequently unite at the bottom, and thus produce a sweet and tender herbage.

As the choice of seeds proper for laying down pastures will be stated, and the best sorts, together with their culture, will be pointed out in a subsequent section; and as, we trust, an accurate view of the comparative advantages capable of being derived from the hard or light stocking of pastures have been already stated (pp. 113, 114), we proceed to consider the proper time for turning cattle into pastures.

In addition then to the intimations on this subject, which have been given in a former section*, we would observe, that from the latter part of March to the close of April, or early in May, will, in the warmer districts of the southern counties, be found most beneficial, in proportion as the season is more or less backward; but, in such as have a more northerly situation, the turning of cattle into the pasture may be delayed for one or two weeks, or even longer, with considerable advantage. The result of this practice is, that the cattle will eat off the central stems of the grass-plants, in consequence of which, as Dr. Darwin has justly remarked, new leaves are produced around the first joint of the stem thus grazed; and, as this management is equally applicable to meadows, a more abundant crop of hay will be produced.

Various expedients have been recommended for the improvement of pastures; among these the practice of scarifying, previously to the spreading of manure, has been

* Chap. III. Sect. II. pp. 110, 112.
found singularly serviceable*. The ground may also be rolled twice or thrice in the course of the spring, at proper intervals, with much benefit; because the grass will be compressed, and acquire a thicker bottom. And, as clovers strike roots from every branch in contact with the ground, they will unite so closely as to present a fine, thick sward, that will shelter the whole surface of the pasture, and flourish amid the most parching droughts.

A peculiar, but excellent, mode of improving poor or indifferent pastures is practised in Yorkshire, and also in the county of Cardigan, which merits the attention of the intelligent agriculturist. The farmers in those districts put up their pastures as soon as they can in May, for the summer season; and during that period no other attention is given, than to remove all noxious weeds. Thus the lands remain unoccupied till December, when the grazing stock are turned in, and every animal is stated to be in excellent condition without the aid of hay, straw, or oats. The winter frost sweetens the grass, which continues uninjured by the snow; but, while the ground is covered with the latter, dry food ought to be given to the cattle. In the ensuing spring, young shoots of sweet grass will spring forth from beneath the shelter of the old grass plants, and both will be eagerly eaten; while, throughout those two seasons, the milk and butter will, it is said, prove in every respect equal to that which may be made at any other period in the year. The advantage of this practice is obvious on lands that have become infested or overrun with moss in consequence of hard stocking, or being grazed too bare; as such pastures will be shortly covered with sweet herbage, and the moss will disappear without requiring the assistance of the plough, or of any surface-manure or top-dressing.

* Ante, pp. 254, 255, where an engraving is given of a useful scarifier, invented by Mr. Macdougal.
§ 2. Meadows.

Under this head are included, as already hinted, those grass-lands which, lying for the most part in low or moist situations, are reserved chiefly for the making of hay. Before we proceed to discuss the various particulars connected with this department of our labours, it may not be useless to observe, that as the present work is chiefly calculated to assist those who are exclusively occupied in the grazing and feeding of cattle, the subject of tillage-lands will be introduced so far only as these are auxiliary to the farmer in affording a variety of vegetable crops, which are adapted for supplying him with succulent food for his stock. And, as there are some soils which may be beneficially employed in tillage, while others may, with more profit, be constantly kept in grass; the management of the former will be noticed in the following section, while the system of treatment proper for meadows will be immediately detailed.

It has been justly observed by an intelligent cultivator*, that the great difficulty is to discriminate what species of land is fit for grass, and what is not. The best meadow-land does not always make the best tillage-land; nor does the best arable produce the best pasture, but frequently the reverse.

The lands which are most proper to remain in grass, and which, if in a state of aration, ought to be converted into grass, are the following, viz.

1. Lands in the vicinity of large and populous towns, where manure is cheap and plentiful, and where the produce of grass-land is always in demand, and consequently dear.

* Mr. Davis, "Communications to the Board of Agriculture," vol. iii. p. 80.
2. Lands situate near rivers or brooks, which are capable of being improved, by irrigation, to a much greater value than can possibly be effected under any other mode of culture.

3. Lands lying in the valleys of mountainous countries, particularly calcareous soils; where old meadow-land is scarce and valuable; and where the greater part of the arable land is of such a nature, that it is almost impossible to convert it into good grass-land.

4. All cold, strong grass-lands, which, if ploughed up, would be inapplicable to the growth of turnips, and to the general purposes of modern husbandry; and which, under the best system of wheat husbandry, would not be so valuable as they now are in a state of grass. An exception however occurs, with regard to land of this description; for, where sea-sand (as is the case on the north-western coast of Cornwall) can be applied, at an easy expence, as a manure, such land may be more profitably employed in tillage.

5. Peaty soils are also best adapted to the purpose of yielding grass; for, though they may be most perfectly reclaimed from producing rank, aquatic plants by tillage, yet, being too tender and too moist to continue long in a state of aration, they should be converted to the state of permanent grass-land as soon as that object is accomplished*.

It ought to be observed, that land intended for grass ought to be such in which it will spontaneously thrive and flourish; consequently, if there be too much moisture, the grass will be injured in the winter by rain and frost, and will soon be superseded by rushes and other aquatic plants.

* "Communications to the Board of Agriculture," vol. iii. pp. 79, 80, &c.
On the other hand, if the land be too dry, the grasses will be killed by the intense heat of summer, and be succeeded by mosses, fern, heath, &c.

No land will make a good meadow, unless it be sufficiently deep to admit the roots of grasses to run down out of the reach of the summer heat, and also sufficiently retentive to hold water long enough to produce fermentation, together with such an absorbent substratum as will drain it before putrefaction takes place; and, if it be not so by nature, it must be rendered so by art. On the contrary, if land be too dry and friable, ploughing will only render it more so. Grass-land of this description, therefore, Mr. Davis observes, ought never to be ploughed, unless it can be made retentive by the application of lime, clay, chalk, or other fossil manures that can be procured on or near the spot, especially marl. Where either of these can be obtained at a moderate expense, and where good crops of grain have not only been produced, but also a tendency is promoted in the land to run again to grass—land of this description, that can be so managed, should be ploughed up, and after being a few years in tillage, particular care being taken not to exhaust it by corn-crops, may be again laid down to grass in a much better state than it originally was.

Beside these various considerations, there are other circumstances of very material moment in the laying down of lands for meadows; which, however, have not (at least till within a few years) been regarded with that attention which their importance requires. In fact, whoever examines the composition even of our best pastures, will find them to consist of a mixture of plants, altogether dissimilar in their nature and properties; and that, with the exception of such as have recently been laid down with rye-grass or clover, they will prove, as a late eminent and
amiable botanist* has justly pronounced them, to "be pretty much in a state of nature; full of an indiscriminate mixture of plants, some of which afford good, others bad food; some good crops, others scarce any crops at all."

The following principles, or requisites, will be found worthy of every person's notice, who designs to lay down land for a state of grass.

The grand requisites then towards obtaining a good meadow are, a perfect acquaintance with the best natural grasses, their peculiar soils, and the best mode of collecting or procuring their seeds.

1. As the best natural and artificial grasses will be enumerated in a subsequent page, we shall at present only remark, that the tendency to promote the thriving and fattening of cattle is an object of essential importance, with which we are as yet but little acquainted, except in the case of the artificial grasses. Hence, as far as it is practicable, every intelligent agriculturist will endeavour, by experiment and minute observation, to ascertain those plants which promise to be particularly useful in this respect, and which have not as yet been cultivated separately. As, however, leguminous vegetables have generally proved to agree with live stock, Mr. Curtis is of opinion we may reasonably infer, that a certain proportion thereof may be useful and beneficial on grass-lands.

An early growth is of equal moment; especially as, from a variety of unforeseen accidents, the most careful and intelligent farmer may not have a stock of

* Mr. Curtis, in his "Flora Londinensis." The same remark occurs in his "Practical Observations on British Grasses," 8vo.; a work with which every grazier ought to be intimately acquainted.
food adequate to the consumption of his cattle. The seasons, indeed, must ever produce great changes with regard to the forwardness of grasses, and the reverse; and hence, the necessity of having warmly situated, and not too humid, inclosures, of a moderate size and well sheltered, as already intimated, will be more clearly obvious; because, in this case, the ill effects resulting from severe winters, or from the prevalence of north-easterly winds during the spring, in keeping the herbage backward, will, Mr. C. remarks, be counteracted as much as is possible for man to counteract them. In fact, the early grasses, the best of which will be specified in the ensuing chapter, appear to be most coveted by cattle, which of course will thrive best on what is most agreeable to their palate; so that an early bite, an early hay-making and hay-harvest, and consequently the early use of the after-grass, or rouen, are important objects to the farmer*.

2. An acquaintance with the peculiar soils, and relative hardiness of grasses, is another requisite, without which no good meadow can be formed, and which can only be derived from actual experiment. Thus some are less able to endure moisture than others, and of course flourish most in the drier situations; while others are totally unfit for dry soils, but vegetate luxuriantly in moist lands; and others again are only fit for the most barren lands, which are unfit to rear any other kinds of grass. Of the first description are the smooth-stalked poa, or smooth-stalked meadow-grass, saintfoin, &c.; of the second are the rough-stalked poa, or meadow-grass, the flote-foxtail and flote-fescue, water poa, or meadow-grass, &c.; and to

* Mr. Tollet, in "Communications to the Board of Agriculture," vol. iii. p. 427.
the third belong the sheep's fescue, hard fescue, &c. &c. There are likewise numerous grasses which delight in almost any soils, except the extremes of wet and dry, which it will be unnecessary here to specify, as they will be detailed in the chapter already referred to.

3. With regard to the procuring of good seed considerable difficulty has prevailed, from the fraud practised by mercenary individuals, who often mix seeds of nearly the same size, in order to save time and trouble in sowing them. Speaking of separated grass-seeds, Mr. Young observes, that he cannot advise a young farmer to pay much attention to this object, unless he proceeds on very sure grounds, by forming a contract for the sale of the seeds at a good price, before he commences his operations. This method he has resorted to, and has found it cheaper to procure the seeds, by having them gathered by women and children, by hand, than to raise them himself, under the determination to have them perfectly free from all mixture. He states (Farm. Cal. p. 242,) that, he has had large quantities of cock's-foot and tall oat-grass gathered at four shillings per bushel, and the crested dog's-tail at a shilling a pound; and has thus laid down many scores of acres, having found them cheaper at these prices than when they were raised in drills with great attention*.

* As, however, it may sometimes happen, that a young farmer may not be able to procure seeds in this way, and consequently is reduced to the necessity of purchasing seeds from the shops; we cannot, on the present occasion, in justice, omit to mention Messrs. Gibbs and Co. seedsmen to the Board of Agriculture, whose indefatigable efforts to procure the best seeds of every description, are, in every respect, worthy of the patronage they have obtained.
In laying down lands to grass, the most important primary object is duly to prepare them for the reception of the seed. Hence the soil ought previously to be brought into the highest possible degree of fertility; for, though land may be too rich for the production of corn, and of such crops as are cultivated for the seed, it is quite otherwise in the case of grass or other crops, where the object in view is the largeness and luxuriance of the plants themselves, as it is in the cultivation of all plants intended for feeding cattle. In such case, indeed, the richness of the soil is a most important consideration; because, the richer it is made, the more abundant crops will it produce, and consequently will support a larger stock of cattle; which making much dung, that is returned again to the land in order to keep up its fertility; whereas effects directly contrary must result from laying down to grass poor land, or such as has been impoverished by successive exhausting crops. Farther, on account of the minuteness of the seeds, and the (generally) fibrous nature of the roots of grass-plants, it is essentially requisite to the formation of a good meadow, that the ground be previously brought into the highest possible degree of pulverization; otherwise the irregularity of the surface will not only occasion an irregularity in the produce of grass, but this will be liable to be materially damaged by excessive droughts before it can have extended its roots, or become firmly settled in the land. This preparatory pulverization of grass-land may be effected in various ways, according to the nature of the different soils. Thus, in light soils, frequent ploughing and harrowing, together with the previous rearing of turnips, potatoes, tares, and other green fallow crops, which, by the shade they afford, as well as the culture they require during their growth, are calculated to reduce the soil into a friable state. And Mr. Young is of opinion, that the preparation of land for grass, either by a fallow or by winter
tares sown very early, and mown in June for soiling, (which will give nearly two months in the very heat of summer for tillage), is one of the most effective for cleaning land that can be adopted. Heavy and stiff soils may be prepared for grass crops by repeated ploughing before winter, and leaving them exposed to the action of the frost during that season, together with frequent harrowing, and sometimes rolling in the ensuing spring; and likewise the introduction of cabbage, clover, rape, beans, or other vegetable crops, which have a power, in consequence of the peculiar formation of their roots, to loosen such compact soils, and reduce them into a fine condition. Besides, all obstructions to the scythe, such as ant-hills, mole-hills*, &c.

* Some of these obstructions have been already noticed (p. 302 and following): in addition to the method of destroying ant-hills there stated, we would recommend the following to the attention of our readers, from Mr. Marshall's "Rural Economy of Norfolk," vol. i. The process recorded by him is as follows: "With a heart-shaped spade, or shovel, the hills were cut up in irregular lumps of from ten to fifteen inches in diameter, and from two to six inches thick. The grass sides of these are turned downward, until the mould side is perfectly dry, when the former is exposed to the air, until the heaps are sufficiently dry to burn. A fire is then kindled by means of brushwood, and kept smothering, by gradually laying on the sods, or lumps, as the fire breaks out, until ten, fifteen, or twenty loads of ashes are raised in one heap. This," Mr. M. observes "is a cheap way of raising manure, while it at the same time removes a nuisance; and no man, having such an opportunity in his power, ought to neglect at least the making of an experiment. Ashes are, on some soils, an excellent manure; and perhaps, generally, ashes thus raised would be found highly advantageous, as a basis or bottoming for farm-yards and dung-hills."

With regard to the removal of mole-hills, various practices are in use; but the most effectual is that derived from the experience of a successful mole-catcher, and communicated to the public by the late Dr. Darwin, in his "Phytologia." This man commenced his operations before sun rising, when he carefully watched their
should be carefully removed, and the land manured. The
manures proper for this purpose having been stated in
Sect. III. of this chapter, it only remains to add, in this place,
that the proper season for this purpose is in February, and
again after the grass has been mown; but, if the application
of manure to grass-lands be omitted after mowing, it ought
on no account whatever to be deferred later than October.

*Seeds.* These Mr. Young directs to be varied accord-
ing to the annexed table.

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<tbody>
<tr>
<td>Cow-grass</td>
<td>White Clover</td>
<td>White Clover</td>
<td>Yarrow</td>
<td>White Clover</td>
</tr>
<tr>
<td>Cock’s-foot</td>
<td>Ray, or Rye-grass</td>
<td>Ray</td>
<td>Burnet</td>
<td>Dog’s-foot</td>
</tr>
<tr>
<td>Dog’s-tail</td>
<td>Yorkshire White</td>
<td>Yorkshire White</td>
<td>Trefoil</td>
<td>Rib</td>
</tr>
<tr>
<td>Fescue</td>
<td>Yorkshire White</td>
<td>Yarrow</td>
<td>White Clover</td>
<td>Yorkshire White</td>
</tr>
<tr>
<td>Oat-grass</td>
<td>Fescue</td>
<td>Burnet</td>
<td>Saintfoin</td>
<td>Ray</td>
</tr>
<tr>
<td>Trefoil</td>
<td>Fox-tail</td>
<td>Trefoil</td>
<td></td>
<td>Fox-tail</td>
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<tr>
<td>Yorkshire White</td>
<td>Dog’s-tail</td>
<td>Rib</td>
<td></td>
<td>Fescue</td>
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<tr>
<td>Timothy</td>
<td>Poa</td>
<td></td>
<td></td>
<td>Timothy</td>
</tr>
<tr>
<td>Timothy</td>
<td>Yarrow</td>
<td></td>
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In regard to the quantity per acre of these plants, Mr.
Y. remarks, that the proportion must necessarily depend
on the means of procuring them. In situations where wo-
men and children are fully occupied, it may be difficult to
situation; and, frequently observing the motion of the earth above
their walks, he struck a spade into the ground behind them, cut
off their retreat, and then dug them up. As moles usually place their
nests at a greater depth in the ground than their common habita-
tions lie, and thus form an elevation, or mole-hill, the next step is to de-
stroy these nests by the spade; after which the frequented paths
are to be distinguished from the bye-roads, for the purpose of set-
ing subterraneous traps. This object may be effected by marking
every *new* mole-hill with a slight pressure of the foot, and obser-
ving the next day whether a mole has passed over it, and destroyed
such mark; and this operation should be repeated two or three
mornings successively, but without making the pressure so deep.
obtain large quantities gathered by hand; and, in such cases, the farmer must be content with what can be purchased. The crested dog’s-tail, indeed, may be so generally procured in this way, that he cannot but suppose it in a good measure at command*. Without adverting to this point, however, he thinks that, from the lands which he has laid down to grass to a considerable extent, and in which he has largely used every one of the plants above enumerated, except the poa, or meadow-grass, the following quantities may be safely recommended. These proportions are also recommended by other eminent cultivators, whose names will be duly specified.

I. CLAY.

<table>
<thead>
<tr>
<th>Seeds</th>
<th>Substitutes</th>
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<tbody>
<tr>
<td>Cow-grass</td>
<td>Yorkshire White - 2 bush.</td>
</tr>
<tr>
<td>Trefoil</td>
<td>Timothy - 4 lbs.</td>
</tr>
<tr>
<td>Dog's-tail</td>
<td>Ditto 4 lbs. or Yorkshire White</td>
</tr>
<tr>
<td>Fescue</td>
<td>1 bush.†</td>
</tr>
<tr>
<td>Fox-tail</td>
<td>1 bush.†</td>
</tr>
</tbody>
</table>

as to alarm the animal, and occasion another passage to be opened. Now the traps are to be set in the frequented paths, and should be made of a hollow, wooden semi-cylinder, each end of which should be furnished with grooved rings, containing two nooses of horse-hair, that are loosely fastened in the centre by means of a peg, and are stretched above the surface of the ground by a bent stick, or strong hoop. As soon as the mole passes half way through one of these nooses, and removes the central peg in its course, the hoop, or bent stick, rises in consequence of its elasticity, and of course strangles the mole. The simplicity of this mode of destroying mole-hills and moles recommends itself to general adoption; as those whose grounds are thus infested may easily extirpate them, or teach the art to their labourers.

* Farm. Cal. p. 448.

† Rev. A. Young, son of the veteran agriculturist, whose labours are so often noticed in this work, in “Communications to the Board of Agriculture,” vol. iii. p. 159.
CULTURE OF GRASS-LANDS.

II. LOAM.

<table>
<thead>
<tr>
<th>Seeds</th>
<th>Substitutes</th>
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<tbody>
<tr>
<td>White Clover</td>
<td>Ray</td>
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<tr>
<td></td>
<td>Rib-grass</td>
</tr>
<tr>
<td>5 lbs.</td>
<td>1 peck.</td>
</tr>
<tr>
<td>Dog's-tail</td>
<td>1 peck.</td>
</tr>
<tr>
<td>10 lbs.</td>
<td>4 lbs.</td>
</tr>
<tr>
<td>Ray</td>
<td>Yorkshire White</td>
</tr>
<tr>
<td>1 peck.</td>
<td>2 pecks.</td>
</tr>
<tr>
<td>Fescue</td>
<td>Timothy</td>
</tr>
<tr>
<td>3 pecks.</td>
<td>4 lbs.</td>
</tr>
<tr>
<td>Fox-tail</td>
<td>Cow-grass</td>
</tr>
<tr>
<td>3 ditto.</td>
<td>5 lbs.</td>
</tr>
<tr>
<td>Yarrow</td>
<td></td>
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<tr>
<td>2 ditto.</td>
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On loams, that are on a substratum of stone-brash, (of which description are almost the whole of the Cotswold-Hills, and great part of the counties of Gloucester, Somerset, Warwick, and Wilts), Mr. Davis* recommends the following quantities to be sown per acre, after marling, in July, viz.

Ray-grass        - 1 bushel.
Marl, or cow-grass - 10 lbs.
White, or Dutch clover 3 lbs.
Trefoil, or hop-clover 1 lb.

All dry soils, however, (and it should be recollected that loam includes every species of soil except clay, peat, and sand), Sir John Sinclair† thinks, may have from two to four pounds of hop or yellow clover, in addition to four pounds of white, and from four to six pounds of marl-grass, or perennial clover, per acre. And he states the following plan to be recommended by Mr. Bridge, a respectable farmer in Dorsetshire, for laying down lands for permanent pasture, viz. To sow marl or cow-grass, hop or yellow clover, and white clover, in the proportion of from six to seven pounds of each, with one bushel of the best Devonshire rye-grass; by which means "there is a perpetual feed for five or six years." The hop-clover and rye flourish early in the spring; the marl-grass is in per-

* "Communications," vol. iii. p. 90.
† lb. p. 10.
DD2
fection in July, when the other goes off; and the white clover is in perfection in August, continuing during the remainder of the season. In some meadows of very rich soil, it is suggested, that lucerne ought to be preferred; and it would be of infinite importance to ascertain the extent to which the culture of that plant could be carried.

III. SAND.

<table>
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<tr>
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<tbody>
<tr>
<td>White clover</td>
<td>7 lbs.</td>
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<tr>
<td>Trefoil</td>
<td>5 lbs.</td>
</tr>
<tr>
<td>Burnet</td>
<td>6 lbs.</td>
</tr>
<tr>
<td>Ray</td>
<td>1 peck.</td>
</tr>
<tr>
<td>Yarrow</td>
<td>1 bushel.</td>
</tr>
</tbody>
</table>

Mr. Greenall, however, recommends the following proportions for soils of the like nature, which he has always found to answer, viz. white clover and trefoil, of each five pounds; ray-grass and the best grass seeds (the last collected as they have fallen from the hay) of each one bushel to the statute acre*.

IV. CHALK.

<table>
<thead>
<tr>
<th>Seeds</th>
<th>Substitutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burnet</td>
<td>10 lbs.</td>
</tr>
<tr>
<td>Trefoil</td>
<td>5 lbs.</td>
</tr>
<tr>
<td>White clover</td>
<td>5 lbs.</td>
</tr>
<tr>
<td>Yarrow</td>
<td>1 bushel.</td>
</tr>
<tr>
<td>Ray</td>
<td>1 bushel.</td>
</tr>
</tbody>
</table>

For these soils, Mr. Boys, of Betshanger, in Kent, advises four bushels of grass seed, from an old pasture, to be sown with eight pounds of rib-grass; white clover and cow-grass seeds, of each four pounds; and a similar quantity of yellow trefoil; which proportions will be sufficient for an acre of land.

V. PEATY SOILS*

Seeds: | Substitutes:
---|---
White clover | Yorkshire white 6 pecks,
Dog's-tail | Rib-grass 5 lbs.
Ray | Cow-grass 4 lbs.
Fox-tail | 2 pecks.
Fescue | 2 ditto.
Timothy | 1 peck.

Without specifying any particular soils, Dr. Wilkinson, an experienced agriculturist of Enfield, Middlesex, recommends the use of trefoil and rib-grass, of each four pounds, white clover twelve pounds, and broad clover four pounds; supposing the grass seeds to be thrown in with barley or oats. The same gentleman also remarks, that it is of consequence that a full quantity of seeds be thrown in†.

Beside these rotations, or courses of seeds for grass-lands, there are several others which have been practised by intelligent farmers, and are deserving of notice.

The following proportions were sown a few years since by the Earl of Darlington:

White or Dutch clover | 17 lbs.
Clean hay-seed | 14 bushels.
Rib-grass | 1½ lbs.
Trefoil | 1½ lbs.

by which means (the soil being previously ploughed very fine and made perfectly level) the land was speedily covered with a thick and excellent herbage. The only exceptionable thing in this practice is, the quantity of seed, which is certainly too large for a statute acre.

Mr. Dalton's (of Sleningford) mode of laying down land to grass‡, is to make the ground perfectly smooth and

* Young in "Communications," vol. iii. p. 151.
† Ibid. p. 243.
‡ Young's Northern Tour.
level, and then sow upon every acre the following seeds, viz.

Hay-seeds - - 6 bushels.
Rib-grass - - 12 lbs.
White or Dutch clover - - 8 lbs.
Burnet - - 5 lbs.

He manures it well with a compost of earth, dung, and ashes, thoroughly mixed together; and folds his sheep upon it, two nights in the same place, which practice answered uncommonly well. The proportion of seed, however, is still too great, though in other respects his management be excellent.

In the laying down of land for the purpose of forming a good meadow, greatly superior to the generality of pastures, the late Mr. Curtis recommends the six following grasses, and two species of clover, to be mixed in these proportions:

Meadow fescue-grass, four parts
Meadow fox-tail-grass, ditto
Roughish meadow-grass, two parts
Smooth-stalked meadow-grass, ditto

Crested dog’s-tail-grass, one part
Sweet-scented spring-grass, ditto
White or Dutch clover, two parts
Common or red clover, ditto

These are to be mixed together, and about three bushels of them sown on an acre, in rows, in order that they may be more conveniently hoed, in consequence of which they will vegetate with increased luxuriance. Towards the end of August, or early in September, Mr. C*, states, that it will be necessary to weed and thin the grasses occasionally, and also to roll them in the spring; by which means the roots, that may have been raised by the frost, will be pressed into the ground. For moist lands, he conceives the meadow-fox-tail and meadow-fescue grasses to be best adapted; as the smooth-stalked meadow and crested dog’s-tail are to dry pastures; while the sweet-scented vernal

* Practical Observations on British Grasses, 8vo.
grasses and meadow-fescue will suit land that is either moist or moderately dry. These plants are assorted to form a good turf speedily; being, for the most part, vigorous perennials, they are not liable to be overpowered by the spontaneous growth of coarse vegetables indigenous to such soils; and, if the land be previously cleansed from all weeds and noxious plants, the combination of grasses above specified will, in the course of two years, produce a most excellent meadow.

Where land is intended chiefly for sheep pasture, it has been recommended to sow three sorts of grasses, in order to obtain the benefit of successive growth. Agreeably to this practice, Mr. Parkinson, an experienced farmer, sows four bushels of ray-grass, or red darnel seed, ten pounds of trefoil (more correctly common clover) seed, and ten pounds of white clover. Thus, he thinks, the ray-grass should be fed off early, before the white clover appears, and while the trefoil or common clover is just springing forth; so that when the ray-grass is eaten down, the common clover will shoot up, and afford excellent food, which will be succeeded by the white clover; and, when this last is eaten, the ray-grass will again vegetate, and afford a supply of food during the winter months. From this practice Mr. Parkinson infers, that one-third more in number of sheep may be sustained than can be effected by any other method.

Generally speaking, however, where the lands thus laid down to grass are intended for sheep, it is not an object of very great moment to sow only the finer sorts of grass, because close-feeding will, after the first year, make any of the coarser kinds fine, sweet, and productive. To this circumstance of close-feeding, that is, preventing the seeds from rising, the Wiltshire downs are indebted for the sweetness of their breed; which, Mr. Davis has judiciously remarked, depends more on its being kept close and being
eaten as fast as it shoots, than on any peculiar good quality of the grass itself; for there are many downs that, when closely fed, appear to be a very sweet pasture; but which, if suffered to run one or two years, without being fully stocked, will become so coarse that sheep will almost prefer starving to the eating of such grass*. And Mr. Young, jun. has had two hundred acres of land, under his management, laid down chiefly for sheep, the fields of which he has stocked so early in the spring, and so thickly, as just to keep down the seed stems; by which management the cock's-foot, oat-grass, and Yorkshire white have proved sweet-feeding grasses, that were not at all rejected even where the flock had a choice†. But it should seem that where a field has been long pastured in this way with sheep, and closely fed, it ought not to be converted into a meadow in order to be mown for hay; because the plants, by being constantly cropped down, acquire a dwarfish habit, however quick their growth may be in that early stage.

With regard to the time and method proper for sowing grass-seeds, there is a difference of opinion; not only as to the season for depositing the seeds in the ground (which is either in the spring, in conjunction with grain-crops, or towards the end of summer, or in August, where the soil has been previously prepared by means of green or other fallows), but also as to the propriety or necessity of sowing them with or without other vegetable crops.

Not to enter into a discussion of the arguments produced in favour of these practices, we state the following results of actual experiments by intelligent agriculturists. Mr. Lyster, of Bawtrey, found, on comparing the vernal and autumnal sowing, that the latter was much the better.

* Agricultural Survey of Wiltshire, p. 18.
† "Communications to the Board of Agriculture," vol. iii. p. 151.
Mr. Dickson, of Belford, made a comparative experiment in the spring; four acres with grasses only, on peas and buck-wheat ploughed in the preceding autumn; five acres with barley; and five with the seeds alone, without either corn or manure. The two divisions that were sown alone were overrun with chickweed, and would have been choked, if this had not been consumed by a dairy of cows: from that time, for a period of seven years, no difference was perceptible between the three divisions. From the extensive experiments of the Earl of Holderness, it appears, that seeds answered best when sown alone. The fact, however, is, as an intelligent agriculturist has remarked, that grass-seeds will succeed almost equally well in either method; though, if a preference were given, it should be to August sowing without corn; but the success which he has witnessed, in both seasons, does not allow any positive opinion. Moors and mountains form an exception; in such situations, snows fall too early to hazard such sowings, which ought therefore never to take place in autumn, or be ventured later than the first week in August. But the better season is the spring, with oats, either for soiling or for hay; though, on strong lands, that sort of barley which runs least to straw, and is earliest ripe, is far preferable to oats, on account of the tendency in barley to loosen the texture of the ground whereon it grows, and consequently to favour and accelerate the growth of the grass; and, for the same reason, on yet stronger lands, grass-seeds may be advantageously sown with thin crops of beans.

Having already adverted to the necessity of bringing grass-lands into a fine state, we shall at present only state, that where a vernal sowing takes place with a crop of corn,

* Rev. A. Young, in "Communications to the Board of Agriculture," vol. iii. p. 142.
† Rev. Edmund Cartwright, ibid. p. 184.
the tillage ought to be given with more than common attention. Hence the land should be ploughed thrice, and afterwards harrowed, or scuffled and rolled, according to the nature of the soil; for, whatever that may be, the ground should be well reduced for grass-seeds. This attention, however, is not so necessary for an August sowing; because the time and season afford so ample an opportunity to prepare, that, if the first earth had been given in autumn, the most negligent farmer can scarcely find any other difficulty than what arises from an uncommonly wet season*. But, in order to complete the formation of a good meadow, it is necessary that the seed be sown as early as possible after the soil has been ploughed, and with as much regularity and uniformity as is practicable. Hence it is obviously necessary that an expert seedsman be employed, and also to guard against the bad practice of seedsmen, who are apt to mix seeds which are nearly of the same size, in order to have the fewer casts. Five pounds weight of any clover, &c. cannot be divided and sown at two casts, but ten pounds may and ought to be divided; and, if the quantity be larger, it is better sown at three. For all small seeds, Mr. Young, jun. has suggested, that the delivery may be best effected by means of the Norfolk turnip-trough, which has been recently adapted to clover and ray-grass†; and it is highly probable, that Mr. Knight’s and the Rev. Mr. Munning’s turnip-drills (which have been already described, pp. 245, 249) may be usefully employed or adapted to putting in grass-seeds. As uniformity of delivery is a point of the greatest consequence, the lighter sorts of grass-seed should never be sown in windy weather, or in wet seasons, when the least degree of poaching might ensue. All grass-seeds should be covered in, by passing a very fine light pair of harrows once over them; and, in the

* Young, in “Communications,” vol. iii. p. 143.
† Ibid. p. 154.
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case of light or porous soils, they may be advantageously rolled.

The successive or autumnal management is a point of considerable consequence, and in proportion to the moisture of the soil. All trampling by cattle and horses is very pernicious; for the soil, after a grain crop, or after the tillage of a fallow, is very “tender,” and affected by every impression. Every sort of stock, therefore, should be carefully excluded throughout the following autumn and winter; for the profit resulting from the bad practice of too early feeding is very small, and not to be compared with that derived from it as a spring pasturage for ewes and lambs. Dr. Wilkinson advises manuring at this time; though this part of the management will not be found material, provided the system of preparation already noticed be attended to.

With regard to the preceding management of new lays, or grass-lands, there is a great difference of opinion, some contending that the new lay should be pastures with sheep; others, by cattle; others, that it should be mown for hay; and others again, that it should be seeded.

The sweetness of pastures on many sheep-downs, we have already observed, depends on the closeness of the feeding; hence many intelligent cultivators, in the North Riding of Yorkshire, feed their new lays with sheep for the first two years*. And where ray-grass, and white or Dutch clover are intended to remain for some years, it has been found profitable to feed them the first year with sheep, which thicken, close, and render them more permanent†.

The mowing of new lays is a beneficial practice, particularly in moist meadows, the soil of which will of course suffer by poaching; in this case, however, it should be early cut, as nothing is more pernicious to new layers than

* Agricultural Report of the North Riding of Yorkshire, p. 43.
† Corrected Agricultural Report of Perthshire, 8vo.
that the grass should run to seed. From an accurate comparative experiment, by Dr. Wilkinson, of sheep-feeding with mowing, the superiority of the former was indeed very great; hence it should seem to be the most profitable management to feed a new lay with sheep for the first two or three years, beyond which time there will be no necessity to continue it any longer; though the Rev. Mr. Young states, that he has had some fields under his care, which succeeded well in feeding four, five, and even six years. In general, he observes, it may be laid down as a rule, that the more land is sheep-fed the more it will be improved, especially if, at any future time, it should be again ploughed for corn; but, in this system of sheep-feeding, the unnecessary and impoverishing practice of removing sheep to be folded in other places, must on no account be attempted.

If the preceding hints be duly regarded, little apprehension can be entertained of a failure; though such an event may possibly take place in extremely unfavourable seasons. It can, however, scarcely happen to more than one or two sorts of seed; and in this, or, indeed, in any case of failure, fresh seeds should be sown in moist weather, during the spring; and it will be advisable to tread them in by turning a flock of sheep into the field, if practicable; but, if this cannot be done, Mr. Young is of opinion, that it should take its chance, for a roller will not so well affect it, and a hammer cannot enter without injury. If a very large fold, five or six yards to a sheep, be run over a field, once in a place, and the seeds be sown before sheep are permitted to enter, success will be almost certain.

Should, however, a total failure, from any unforeseen circumstance, take place, he recommends, in fields that were sown in the spring, to clear the grain as early as possible; and, ploughing once, to harrow in fresh seeds immediately. These will succeed very well, if they be
got in during the month of August—the sooner the better—and in this case the land ought to be very well rolled in the month of October, in a dry season. If the failure happen on land sown in August, he advises to give the land three earths, or ploughings, in dry weather in the spring, and to re-sow grass-seeds with buckwheat in May; of which he remarks, that though it be not a crop calculated for clays and wet loams, yet it sometimes answers in dry summers; and in wet seasons, though it will give little seed, yet it may be mown, while in blossom, for soiling cows.

If the land be laid down agreeably to the hints already given, manure will not be found essential, notwithstanding it will at all times be beneficial. In addition, therefore, to the remarks already stated on the subject of manuring grass-lands, we have to observe, that, if manure be applied the first year, the best time for this purpose is in August or September, being then a year old, when a moderate dressing will greatly contribute to promote the thickening of the herbage. But, on soils that are rather unfavourable to grass, and on which the success is at all doubtful, (if the application of manure can only be once made), it would be better delayed to the period when new lays are apt to fall off, that is in August, in the third year; but, if the grass be mown, the best time for manuring land will be immediately after clearing off the hay.

Early in March, the grass of old-watered meadows is, in general, sufficiently forward to receive sheep, which are accordingly fed on it during that season; and to those farmers or graziers, who reserve water-meadows for the purpose of breeding or fattening sheep, the grass thus produced is almost invaluable, on account of the scarcity of green feed which then usually prevails. In order to afford

an abundant pasturage to any kind of farming stock; for, though the general practice is to admit only sheep into water-meadows, yet, upon good, sound gravel, Mr. A. Young, sen. thinks, any heavier stock may be allowed to enter them); the water should, according to Mr. Wright, be taken off for nearly a week, that the land may become dry and firm before the heavy cattle are admitted. In the first week of eating off the grass of water-meadows, it will be proper to give the cattle a little hay in the evening, to intermix with their moist food. But the best mode of employing such grass is, to hurdle off certain pieces or spots, in the same manner as is practised for turnips. The ewes and lambs are to be removed toward the end, or, at all events, on the last day, of April, by which time the land will probably be fed bare; and it should be remarked, that the closer meadows are fed, these will be more improved, and the subsequent crop of hay will be finer in quality. Immediately after the stock are cleared out, Mr. Boswell* directs a week’s watering, with a careful examination of every trench and drain; taking particular care that the water only dribbles over every part of the panes as thin as possible, this being the warmest season of the year; and also to mow the long grass that obstructs the water in the trenches, which operation is best performed at this time. The weeds, leaves, &c. are to be taken out, and thrown into heaps, for carriage to the farm-yards. The first watering should not be suffered to continue longer than two or three days, before it is shifted off to another part, or meadow, which, by this time, may be fit for receiving the water; and thence to a third or fourth meadow, if the occupier possess so many. Should the season prove wet, the water ought not to remain so long on the ground, warmth being the greatest requisite, after the land is once wet, to assist vegetation; and in the course of five, six, or

* Treatise on Watering Meadows, p. 110.
seven weeks, the meadows will be fit to mow for hay. By the
time three or four parts, or meadows, have been thus
regularly watered, the first will be found to have an after-
math, _eddish_, or after-grass, with an astonishingly rich and
beautiful verdure; and both the quantity and quality of the
produce will greatly exceed what could be expected, when
compared with the state of the lands before they were irri-
gated. This after-grass is eaten off in autumn by cattle,
especially milch-kine; but sheep ought on no account to
be permitted to enter water-meadows in that season, as they
will infallibly be _rotted_. Although the cause of the rot is
at present unknown, yet it is an indisputable fact, that the
autumnal feeding of sheep in water-meadows is as destruc-
tive as the vernal pasturage is beneficial to them. Hence
Mr. Boswell advises, that “no sheep, except those which
are just fat, must be suffered, even for an hour, in water-
meadows, except in the spring of the year; and even then
care must be taken that every part of the meadow be well
watered.” And he adds, that water-meadows, made from
low, boggy, or swampy land, will infallibly rot the sheep at
any other season than the spring; though a contrary effect
is produced when the meadows are made from dry land*.

Having already noticed the comparative advantages re-
sulting from the scarifying, or rolling, of grass-lands in
general, we shall at present only remark, that the rolling of
water-meadows during the spring is an excellent method.
Mr. Boswell directs it to be done after Candlemas, when
the land has been laid dry for a week; and the meadow to
be rolled “lengthways of the panes,” up one side of the
trench and down the other. This practice also contributes
greatly to the grass being mown close to the surface, an
advantage of no trifling consideration; for the ant-hills,
mole-hills, and other obstacles to the scythe being thus
pressed close to the ground, the mowing will be fairly and

* Boswell’s Treatise, p. 112.
clearly performed; whereas, when this circumstance is not duly regarded, the workmen will always mow over them, in order to avoid the inconvenience resulting from the edge of the scythe being taken off, and consequently the work is imperfectly executed, while much valuable feed is necessarily lost.

Mowing.

The time of cutting grass for hay ought to be regulated according to its growth and maturity for affording the best and most nourishing food; it being extremely detrimental to grass-crops to cut them too early, because the sap has not properly circulated throughout the blade; so that, when the grass is converted into hay, it shrinks, and is materially reduced in point of quantity. The grass, however, will receive equal injury, if it be allowed to stand till it sheds its seeds; the best time, therefore, for mowing water-meadows is when the grass is in full blossom: with respect to other grass-lands, when the tops of the grass appear brown, it is an indication that it is in a proper state for cutting. Another criterion for directing the farmer's attention to this business, where grass is very thickly spread over the field, is afforded by the yellow hue which the bottom parts of the blades assume before the grass becomes in full flower; in this case, also, it will be necessary, as speedily as is practicable, to mow the grass, which will otherwise be liable to rot, or at least to acquire an unpleasant flavour, that will consequently diminish its value.

The very early or rich meadows, and highly-manured upland-pastures, in the neighbourhood of large towns and cities, will be ready for mowing in June; and all meadows and pastures, which may not be cut in that month, ought to be mown in July. In performing the work, the chief object is to see that the grass be cut as close to the ground as possible, and perfectly level; for grass, Mr. Young re-
marks, will never thrive well that is not mown quite close; and the loss in the crop of hay is very considerable, as "one inch at bottom weighs more than several at the top."—According to the present mode of mowing grass, the labourers trace two parallel lines with their feet, which they move forward alternately, after every stroke of the scythe: in lieu of this method it has been recommended, by the late eminent agriculturist, Du Hamel, to trace the mower's path in a single line only; because he ought to advance with one foot before another in such a manner that the left foot, which is behind, should always forward the right foot. By adopting this practice, it is stated, that the labour will be performed both with greater dispatch, and also with more ease to the labourers, who will thus be secured from those sudden and painful cramps in the left side, with which they are often attacked in the common mode of cutting grass.

Hay-making.

In converting grass into hay, it is of essential importance to have a proper supply of hands ready for the work. In some districts two or three are reckoned to be sufficient to attend a mower (who, if he be an expert workman, and the soil and crop be favourable to his labour, can cut from three quarters to one acre in a day); but in the county of Middlesex the allowance is five haymakers, of both sexes, including loaders, pitchers, stackers, &c. In that county the making of hay has been brought to a degree of perfection altogether unequalled by any other part of the kingdom; and which, after having stood the test of long practice and experience, is found to be attended with the most desirable success. Even in the most unfavourable weather, the hay made according to the Middlesex manner is superior to that made by any other method, under similar circumstances; we shall, therefore, state this practice,
(which is little known beyond the boundaries of that county), for the information of our readers, from Mr. Middleton's very interesting "Corrected Report of the Agriculture of Middlesex."

"First day.—All the grass mown before nine o'clock in the morning is tedded (or spread), and great care taken to shake it out of every lump, and to strew it evenly over all the ground. Soon afterwards it is turned, with the same degree of care and attention; and if, from the number of hands, they are able to turn the whole again, they do so, or at least as much of it as they can, till twelve or one o'clock, at which time they dine. The first thing to be done after dinner, is to rake it into what are called single wind-rows*; and the last operation of this day is to put it into grass-cocks.

"Second day.—The business of this day commences with tedding all the grass that was mown the first day after nine o'clock, and all that was mown this day before nine o'clock. Next, the grass-cocks are to be well shaken out into staddles (or separate plats) of five or six yards diameter. If the crop should be so thin and light as to leave the spaces between these staddles rather large, such spaces must be immediately raked clean, and the rakings mixed with the other hay, in order to its all drying of a uniform colour. The next business is to turn the staddles, and after that to turn the grass that was tedded in the first part of the morning once or twice, in the manner described for the first day. This should all be done before twelve or one o'clock, so that the whole may lie to dry while the workpeople are at dinner. After dinner, the first thing to be done is, to rake the staddles into double wind-rows†; next,

* That is, they all rake in such manner, as that each person makes a row, which rows are three or four feet apart.

† In doing which, every two persons rake the hay in opposite directions, or towards each other, and by that means form a row
to rake the grass into single wind-rows; then the double wind-rows are put into bastard-cocks; and lastly, the single wind-rows are put into grass-cocks. This completes the work of the second day.

"Third day.—The grass mown and not spread on the second day, and also that mown in the early part of this day, is first to be tedded in the morning; and then the grass-cocks are to be spread into staddles, as before, and the bastard-cocks into staddles of less extent. These lesser staddles, though last spread, are first turned, then those which were in grass-cocks; and next, the grass is turned once or twice before twelve or one o'clock, when the people go to dinner as usual. If the weather has proved sunny and fine, the hay, which was last night in bastard-cocks, will this afternoon be in a proper state to be carried*; but if the weather should, on the contrary, have been cool and cloudy, no part of it probably will be fit to carry. In that case, the first thing set about, after dinner, is to rake that which was in grass-cocks last night, into double wind-rows; then the grass which was this morning spread from the swaths, into single wind-rows. After this, the hay, which was last night in bastard-cocks, is made up into full-sized cocks, and care taken to rake the hay up clean, and also to put the rakings upon the top of each cock. Next, the double wind-rows are put into bastard-cocks, and the single wind-rows into grass-cocks, as on the preceding days.

"Fourth day.—On this day the great cocks, just mentioned, are usually carried before dinner. The other operations of the day are such, and in the same order, as before.

* It seldom happens, in dry weather, but that it may be carried on the third day.
described, and are continued daily until the hay-harvest is completed.

In the course of hay-making, the grass should, as much as possible, be protected both day and night, against rain and dew, by cocking. Care should also be taken to proportion the number of haymakers to that of the mowers, so that there may not be more grass in hand, at any one time, than can be managed according the foregoing process. This proportion is about twenty haymakers (of which number twelve may be women) to four mowers: the latter are sometimes taken half a day to assist the former. But in hot, windy, or very drying weather, a greater proportion of haymakers will be required than when the weather is cloudy and cool.

It is particularly necessary to guard against spreading more hay than the number of hands can get into cock the same day, or before rain. In showery and uncertain weather, the grass may sometimes be suffered to lie three, four, or even five days in swath. But before it has lain long enough, for the under side of the swath to become yellow (which, if suffered to lie long, would be the case), particular care should be taken to turn the swaths with the heads of the rakes. In this state it will cure so much in about two days as only to require being tedded a few hours, when the weather is fine, previous to its being put together and carried. In this manner hay may be made and stacked at a small expence, and of a good colour, but the tops and bottoms of the grass are insufficiently separated by it.

There are no hay-stacks more neatly formed, nor better secured, than those of Middlesex. At every vacant time, while the stack is carrying up, the men are employed in pulling it, with their hands, into a proper shape; and, about a week after it is finished, the whole roof is properly thatched, and then secured from receiving any damage from the wind, by means of a straw rope extended along the
The eaves, up the ends, and near the ridge. The ends of the thatch are afterwards cut evenly below the eaves of the stack, just of sufficient length for the rain-water to drip quite clear of the hay. When the stack happens to be placed in a situation which may be suspected of being too damp in the winter, a trench of about six or eight inches deep is dug round, and nearly close to it, which serves to convey all the water from the spot, and renders it perfectly dry and secure.

"The Middlesex farmers are desirous of preserving the green colour of their hay as much as possible, though a lightish brown is of no disservice to it. Hay of a deep brown colour, occasioned by its having heated too much in the stack, is said to weaken the horses that eat it, by promoting an excess of urine, and consequently it sells at a reduced price."

"In the making of hay, some attention should be paid to the quality of the soil, and the kind of herbage growing on it. The hard, benty hay of a poor soil is in little or no danger of firing in the stack; and should, therefore, be put very early together, in order to promote a considerable perspiration, as the only means of imparting a flavour to such hay, which will make it agreeable to horses and lean cattle; it will be nearly unfit for every other sort of stock.

"It is the succulent herbage of rich land, or land highly manured, that is more likely to generate heat sufficient to burst into flame, as it has sometimes done: of

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*Observation. If you would make your hay come out of the stack of a fine colour, and the beauty of the flowers to appear, the hay you have shaken out of bastard-cocks, to prepare for carting, should be cocked in the heat, and remain till the next morning; then turn and open the cocks, for the air to take away the damp that is collected, which otherwise would heat in the stack, and of course the beauty of the colour would be done away."
course, the grass from such land must have more time allowed in making it into hay. This the Middlesex farmers are perfectly aware of; and, when the weather proves moderately drying, they make most excellent hay. But when very hot or scorching, they, as well as most other farmers, under similar circumstances, are sometimes mistaken. In such weather the grass becomes crisp, rustless, and handles like hay before the sap is sufficiently dissipated for it to be in a state fit to be put into large stacks. But if that be done when it is thus insufficiently made, it generally heats too much, sometimes becomes *mow-burnt*, and, in some cases, though very rarely, has taken fire*.

In making hay from the grass of watered meadows, Mr. Boswell directs a *confidential* person to follow the mowers, ready to ted the grass immediately after it is cut, in which state it may remain all the first day. On the following morning, as soon as the dew is evaporated, it must be repeatedly turned, and formed into small cocks, the trenches and drains being raked clean out. The next day it is again tedded and raked nearer together; the grass occupying a less space of ground in proportion as it withers; it is afterwards repeatedly turned in the course of the day, and long before night formed into *whales*, or rows, afterwards into large cocks, and the ground is again raked around them. On the succeeding day those cocks are again spread and turned; when, if they be not sufficiently dry, they are put into still larger cocks; and the following day they are opened, and the grass, after being turned, is carried to the stacks†.

The method recommended by Mr. Boswell corresponds, in some respects, with that proposed by Dr. Anderson.

* Hay stacked in a barn in the same state, would not heat too much; and as to firing, no such thing was ever known.

† Boswell’s Treatise on Watering Meadows, p. 130.
This eminent agricultural philosopher directs the grass not to be cut until it is perfectly dry; immediately after which it is to be formed into small, narrow cocks, about three feet in height, each cock being slightly thatched by drawing a little hay from the bottom of the cock, that is laid on the top, with one of the ends downwards. By this expedient the hay is stated to be effectually secured from rain and wind, except indeed a violent storm should occur immediately after forming the cocks. Provided the grass be thoroughly dry when these cocks are formed, Dr. A. asserts, they will never fit so closely as to heat; though, in the course of one or two days, they will become so firm that a hurricane only can overturn them. In these cocks, he farther directs the hay to remain for one or two weeks, till, on inspection, it is judged they will keep in pretty large 

*tramp-cocks*; when two men, each being provided with a pitchfork, carry the small cocks to the spot where the tramp-cocks are to be formed. The benefits resulting from this practice are stated by Dr. A. to be—

1. A considerable reduction of labour; and 2. That the hay continues nearly as green as when it was first cut, and also retains its natural juice, in the greatest perfection; whereas, by tedding it, &c. as is usually done, the grass becomes bleached, its juices are exhaled, and the hay is often injured by rain. Much caution, however, must be observed, that the grass be thoroughly dry, when first formed into small cocks; as, if there be the least degree of moisture, the grass will, in a very short time, become mouldy, and clog so closely together as to be impenetrable to the air, and never become properly dry without exposure to the sun. To prevent any accident of this sort from occurring, Dr. A. recommends the mowing to begin during fine, serene, and settled weather, in the morning, and on no account to let the haymakers touch it till the dew is evaporated. This method of making hay is but little known in England; though one
instance is recorded of its successful adoption, by David Barclay, esq. of Walthamstow, in the county of Essex, with a slight variation as to the mode of conveying the hay to the stack. This was effected by Mr. B. by fastening a cart-ropo round the bottom of a large cock, which was drawn, before, by a horse, to the stack, while a man, stationed behind, fixed a pitchfork into the cock, and thus pushed it forwards*.

A middle course has been suggested in the "Phytologia" of the late Dr. Darwin, between the different modes of hay-making in use in the northern and southern parts of this island. If the swath of mown grass be turned over only once in the day, for three or four successive days, the interior parts of it will, in a manner, be dried in the shade; and, if it were spread over the ground for a few hours in the day, he thinks the hay would become dry enough for stacking. At night, Dr. D. strenuously advises to form the grass into small cocks—particularly in damp weather—in order to secure it from being injured by the slime and excrements of the very numerous worms that rise to the surface of the ground during moist, warm nights. With this view the cocks are to be made as high in proportion to their base as possible, that a small surface may come in contact with the ground, while a broader top is exposed to the air, and consequently the exhalation of moisture from the hay is promoted, while it is at the same time secured from accidental showers.

In wet weather, (no uncommon occurrence in this variable climate,) Dr. Darwin is of opinion, that it is best to turn the swaths every day, or every second day, or to form it into small cocks, with the view of sheltering the whole from injury by long-continued rains, and also of preventing the parts next the ground, as well as in the middle, from

fermenting. When the weather is more favourable, Dr. D. directs the hay to be made into large cocks, for the more speedy exhalation of moisture by the action of the air, while an incipient fermentation will evolve or discharge a portion of heat, and thus promote the drying of the hay by increasing the evaporation.

Various contrivances have been suggested; under the name of *hay-sledges* and *hay-sweeps*, in order to promote the getting hay together in showery or unfavourable weather. Of the former description is the sledge, employed for this purpose in Yorkshire: in loading it, the hay is previously raked into rows; the sledge is then brought to the end of one of them, and one of the horses is made to pass on each side, until a quantity proper for a load is collected together. One of them now crosses the hay-row, when the load is conveyed to the stack; after which the horses are turned round, and the sledge is drawn back to the field for another load. With this hay-sledge and two horses the hay may be loaded, and conducted to the spot where the stacks are forming, more speedily than can be effected by a cart. It is a simple and effective implement, and appears to be chiefly calculated for dry lands, the surface of which is irregular, or where the ridges are high; as Mr. Middleton’s *hay-sweep* is eminently adapted for ground of a contrary description. As our limits will not permit a detail of the machinery of which this contrivance is composed, we can only state that, previously to using it, the hay is to be formed into rows; and the horses being harnessed, the drivers mount them, and drive them slowly on, so that the sweep collects the hay within it. Should the ridges be high, or the surface of the soil be irregular, it will be requisite to stick the prongs of a fork occasionally into the hay, just before the machine, in order that this may more effectually catch it. When the *sweep* is full, and the load is to be drawn to a distant place, the horses must be
kept as closely together as possible*. In the wet summer of 1795, this contrivance was found peculiarly serviceable; and, if the drivers be steady, and the horses tractable, or accustomed to the work, ten acres of hay, it is said, may be effectually secured in the space of little more than one hour.

With regard to the stacking, or housing, of hay in barns, there is a wide difference of opinion between many eminent agriculturists. In Lancashire, and also in some of the more northern counties, hay-barns have been erected on pillars, and covered with slates. The floors of some of them are boarded with loosely-placed planks, perforated with holes, and lying hollow for a certain space above the ground, for the purpose of admitting a free circulation of air beneath. These buildings are cheap, useful, and very convenient in bad weather; and, in those districts where large quantities of hay are made, barns are certainly preferable to stacks; for, not only is there considerably less litter and waste, but also a very material saving in straw; beside which they afford such advantages in preserving hay, as will in a short time amply repay the expense of erecting them: this, we trust, sufficiently appears from Mr. Middleton's statement, given in a former page, so as to render any farther remarks unnecessary.

Where the practice of stacking hay is adopted, great caution is necessary, that the hay be not put together before it is perfectly dry; otherwise it is liable to ferment, and not unfrequently whole stacks are reduced to ashes for want of due regard to this circumstance. The shape of stacks is a matter of little moment: for farm consumption, indeed, circular stacks are preferable, particularly where straw is scarce. But the square or oblong form is pre-

* "Transactions of the Society for the Encouragement of Arts, &c." vol. xiv, where Mr. Middleton's hay-sweep is described, and illustrated by an engraving, representing it at work.
ferable, where straw is no object, as they are not only more convenient in cutting out hay, to form trusses for the market, but also admit the air more fully. The size likewise depends on circumstances, and should always be adapted to the quantity of hay: the dimensions most proper for the staddles, or stack-bottoms, may in general be from twenty to twenty-four feet in length, by thirteen or fourteen in breadth.

In order to stack hay in the most compact manner, framed stages are commonly made use of: one of the most convenient contrivances of this description is the bay-stacking apparatus of Sir Joseph Banks, which costs about £20*. It may be proper to remark, that the hay ought to be well trodden down; and that, in erecting the stack, the middle should be uniformly raised somewhat higher than the sides. Should the hay, by any unforeseen occurrence, have been damaged by sudden or successive rains, and apprehensions be entertained lest it should turn out unprofitably, Mr. Young strongly advises, and his advice is followed by the most eminent agriculturists, to salt the hay as it is stacked; strewing a peck in layers in the stack to a load of hay. It will, he observes, have a very great effect in sweetening it, however bad it may be, even to blackness; and experience proves, that every species of cattle will prefer inferior salted hay, which they would not otherwise have touched, to the finest hay without that addition; for the salt, by assimilating with the juices of the hay, prevents too great a degree of fermentation from taking place, and consequently prevents it from taking fire, while it imparts a superior flavour.

In order to prevent hay-stacks from taking fire, it is a frequent practice to make holes, or form chimneys or funnels in the middle of them, in order to draw off the super-

* This contrivance is described and illustrated by an engraving in the "Annals of Agriculture," vol. x.
abundant heat; but the advantage thus gained is counterbalanced by the increased degree of moisture attracted by the hay, which is consequently injured. Hence they should be avoided as much as may be; and, in fact, by adopting the precaution of salting the hay, the use of funnels may be altogether dispensed with. As, however, it is of some importance to ascertain the precise degree of heat in the hay-stacks, we know of no method more simple or effectual than that which was practised by the late Mr. Ducket. It consists simply in thrusting a scaffold-bolt, or other stout and long iron bolt into the hay-rick, to give an easy admission to a gun, or ram-rod, furnished at the end with a strong worm. With this he used to screw out a sample, and thereby discovered not only the heat, but also the colour of the hay; and, if the stack required air, he perforated it in several parts in the like manner, which answered every purpose of a chimney or funnel*. Where, however, a hay-rick is discovered to be in a state of fermentation, and the convenience of a ram-rod and screw cannot be obtained, (an occurrence which at present is not likely to take place), instead of throwing down the stack, which only accelerates the heat into a flame, from the sudden access of air, we would recommend the stack to be gradually taken down, and the exterior layers carefully detached, by which means any sudden inflammation from the current of air will be effectually prevented.

Before we dismiss this subject, we would call the attention of the industrious farmer to the minutiae of management that might otherwise possibly escape him, amid the multiplicity of his necessary engagements, viz. That he turn his store-cattle for a few days into the meadow immediately after the hay is cleared out of it, "to pick about the hedges," as the phrase is in West Devon. For the

herbage, which is then succulent and edible to the store cattle, would, before the after-grass was ready to be pastured off, become unpalatable, and be altogether neglected by young cows or fatting stock, with fresh succulent herbage before them. It would, however, be evidently improper, Mr. Marshall observes, to suffer such cattle to continue in newly-mown grounds after they have performed the principal attention*

*Rouen, after-math, or after-grass.

Various modes are practised, in order to make the most of the after-grass; in the vicinity of large towns, or where lambs are suckled to a great extent, it may be advantageous to take a second crop of hay, in the mowing of which greater attention is necessary than in the first instance, from the greater difficulty of cutting the grass-crops occasioned by their lightness, so that, unless in the case of very skilful mowers, the scythe is apt to rise and pass over the grass without fairly cutting it. The proper time for this purpose is, as soon as there is a sufficient length of rouen to cut, and the operation of mowing should be performed very early in the morning, before the sun can have evaporated the dew. The subsequent business varies in no respect from that pursued in making the first crop of hay: less time, however, will suffice; but rouen-hay must be well made and preserved, otherwise it will become mildewed or mouldy, and be rejected by cattle. The hay from the eddish, or after-grass, of water-meadows is very inferior to that of upland-meadows; the grass, not having had sufficient sun nor time to harden it, is soft and woolly, "and has no proof in it: cattle are fond of it," Mr. Boswell remarks, "but it will starve them." On

*Rural Economy of the West of England, vol. i. p. 211.
this account, therefore, it will be advisable to turn neat cattle only into the eddlish of water-meadows, as already intimated; and to remove the after-math of other grasslands for the trying season of spring, when turnips are scarce, and the rouen will prove a most seasonable supply for ewes and lambs.

If after-grass be consumed in the general manner by feeding, shortly after the fields are cleared of hay, or in autumn, its value will be very small, rarely amounting (unless in the case of watered meadows) to more than from 7s. 6d. to 12s. or 15s. per acre, on account of the abundance of food usually prevailing at that season; but if it be kept for ewes and lambs, and other stock, in the depth of winter and the trying season of spring, when food is scarce, it becomes of the greatest value. Tolerable rouen, Mr. Young states, will carry ten ewes and their lambs on an acre throughout the month of April, and will then be worth thirty or forty shillings; and, should the season prove backward, a farmer who is provided with it would not be tempted to dispose of it for a larger sum. The young farmer, therefore, should make as large a reserve as he can possibly spare for these pressing contingencies.

Having stated in the preceding part of this work the most useful modes of consuming the after-grass, we have only to add a few hints as to the time proper for shutting it up for use during the following winter and spring. This, Mr. Young justly remarks, depends on the richness of the soil: lands of moderate fertility, which let from 12s. to 1l. 5s. per acre, should be shut up immediately after they have been mown; but, in fields of greater luxuriance, that rent from 25s. to 35s. per acre, he thinks August is a better month, feeding till then quite bare; and, on still richer lands, September may do. On the fine salt-marshes of Lincolnshire, indeed, there is such a spring throughout the winter, that two sheep an acre are fed
without any previous exclusion. "This branch of husbandry cannot have too much attention, for it is by far the most certain dependance a man can have for his flock, at the most pinching period of the whole year*."

CHAP. VII.

GRASSES BEST CALCULATED FOR MEADOWS AND PASTURES.

SECTION I.

NATURAL GRASSES USUALLY CULTIVATED.

1. Crested Dog’s-tail (Cynosurus cristatus).

This grass will be found useful in the formation of upland pastures, as it affords a wholesome food for sheep: it produces a thick, short turf, and flowers in June. It abounds with seed, which may be easily procured; but attention should be paid that the seed is ripe, otherwise it will fail, as was the case with eight bushels which the Rev. A. Young once ordered to be sown on eight acres, and which never came up on account of its deficiency in ripeness*.

2. Darnel, or Ray-grass, (Lolium perenne).

This valuable grass is now well known and cultivated throughout England; though, from its having been cultivated in improper situations and from improper seed, a considerable prejudice has been raised against ray-grass. It is accused of running so much to seed-stalks, that, after a short time in the spring, it is refused by cattle. In a proper soil, however, this is not the case. Darnel abounds with succulent leaves, that are extremely grateful to cattle: it attains the height of two feet, and flowers toward the end of May or

* "Communications to the Board of Agriculture," vol. iii. p. 145.
early in June; and, by its early springing up, it supplies cattle with wholesome food at a time when it is very difficult to be procured. "Clean hay, made of this grass," says Mr. Sole*, "is particularly preferable for race-horses or hunters, as it does not affect their wind, nor blow them as other hay does; and notwithstanding it runs all to bents, yet the juice is so concentrated in them as to afford greater nourishment. Mr. Croom had a fine crop of it last summer, well got in, and his horses were so fond of it as to reject clean corn for it." Mr. Pacey, of Northleach, Gloucestershire, has within a few years cultivated the natural sort with great success, and to such an extent as to sell a considerable quantity of the seed annually, at 10s. 6d. per bushel. It has, by competent judges, been proved to be infinitely superior to the cultivated ray-grass, and he has a sufficient demand for his whole produce.

3. *Meadow-fescue (Festuca pratensis).*

The meadow-fescue is an early grass, thriving with uncommon luxuriance in almost every soil, producing very sweet herbage, making excellent hay, and producing abundance of seed which may be easily gathered. It flowers about the middle of June.

4. *Meadow-fox-tail (Alopecurus pratensis).*

This is one of the earliest grasses produced in our climate: it vegetates quickly, and with such uncommon luxuriance that, according to Mr. Curtis, it may be well cut thrice in the year. Its stalks are strong, and provided with soft, juicy leaves, of a sweetish, agreeable taste; and, when made into hay, possesses neither the hardness of straw nor the roughness and unpleasant taste attendant on some of

† Ibid. p. 146.
the grasses. It is, therefore, justly considered as holding
the first place among the good grasses, whether used in a
fresh state as fodder, or made into hay, especially for the
larger cattle. The soil best suited to it is sound meadow-
land, occasionally overflowed; though it will succeed on
almost any soil, except the extremes of wet and dry.

The meadow-fox-tail yields abundance of seed, which
may, according to Mr. Martyn, be easily procured; but
Mr. Swayne states it to be subject to be destroyed by an
insect*.

5. Smooth-stalked Poa, or Meadow-grass, (Poa
pratensis).

This grass is one of the finest and most useful of any
we have: it vegetates on the driest soils, and may be seen
flourishing on the tops of walls. It flowers in May, and
possesses the very valuable property of resisting excessive
drought, having been remarked to be green in the gravelly
pastures near London, when every other grass has been
parched by drought. The smooth-stalked poa yields abun-
dance of seed, which, in a separate state, are difficult to
sow, on account of their filaments causing them to adhere
together; to counteract this inconvenience, Mr. Swayne
recommends them to be put into newly-slaked lime, in
order to separate them; and Mr. Tollet thinks, that, if they
were afterwards well rubbed in a sufficient quantity of dry
sand, they may then be sown with proper regularity.

Mr. Curtis says, in his valuable Flora Londinensis, the
smooth-stalked poa is a sweet grass, and readily eaten by
cattle in general. It carries its verdure in the winter bet-
ter than most others, and in the following spring throws
out numerous young shoots, so as to make excellent spring

* Tollet, in "Communications to the Board of Agricul-
ture," vol. iii. p. 428.
food. It produces a good crop of leaves at the bottom, which make exceedingly fine hay, and is fit for cutting early in the spring.

6. *Yorkshire White, or Meadow Soft-grass (Holcus lanatus)*

is a perennial, flourishing well in any moist situation, and growing very generally, except on the most barren and dry soils: it flowers in June and July. It is chiefly calculated for sheep, and has answered uncommonly well, when closely fed. This grass is not much relished by other cattle, and is very injurious to horses, which become affected with a profuse discharge of urine and general weakness. Should any hay, made from this grass, be accidentally given to these animals, an immediate change of food will prevent any farther ill effects.

7. *Sweet-scented Vernal, or Spring-grass, (Anthoxantum odoratum),*

is one of the earliest British pasture-grasses, and grows in almost every situation, though it is not equally productive: it flowers in May and June. Mr. Swayne thinks it of little consequence, as it is neither very productive to the farmer, nor relished by cattle. Other agriculturists, however, are of a different opinion; and Mr. Sole conceives, that the spring-grass would be a useful addition to meadows, if sown in the proportion of one-eighth*. This is the only odoriferous grass produced in our climate, and imparts the delicate flavour perceptible in new hay. It is less productive of seed than many of the other grasses; and Mr. Curtis states, that, in certain situations, particularly in dry seasons, its leaves are liable to become blighted, from a disease which changes their colour to an orange

tinge, and which is very hurtful to this vegetable when in a state of cultivation*.

SECTION II.

WILD OR UNCULTIVATED GRASSES, WORTHY OF CULTIVATION.

1. Sheep's Fescue (*Festuca ovina*)

is a perennial grass, growing in dry, sandy soils, and flowering in the month of June. Cattle in general will eat this sort of grass, to which sheep are extremely partial, and soon become fat from its use.

2. Hard Fescue (*Festuca diuuscula*)

flourishes in almost every situation, wet or dry, and is in blossom in June. This grass has a peculiar claim to the attention of practical agriculturists, as it is very luxuriant, often attaining the height of three or four feet, and shoots forth very early in the spring. It affords a wholesome food, which is much relished by cattle.

3. Annual Poa, or Meadow-grass, (*Poa annua*),

sometimes called Suffolk-grass, grows in pastures, gravel-walks, and the borders of fields, and is in flower throughout the summer. Cattle of every description are very partial to this species of poa; and, as it is found in the greatest abundance in the county of Suffolk, where the best salt-butter is made, it has been strongly recommended to notice by the late Mr. Stillingfleet, who conceives it to be the best for milch cows.

4. Creeping Bent-grass (*Agrostis stolonifera*)

grows in moist fields and meadows, and affords a wholesome food to cattle: as it vegetates with such luxuriance

* Curtis's Practical Observations on British Grasses.
as to suppress the growth of mosses and other weeds, it has a claim to the attention of the experimental farmer.

5. *Tall Oat-grass (Avena elatior)*

flowers in June and July: it vegetates with uncommon luxuriance, and, though coarse, is very profitable when closely fed down, and makes tolerable hay. Its seed may be easily procured; and, from an experiment of Mr. Swayne, it appears to have yielded a greater weight than any other sort of grass*.

6. *Yellow Oat-grass (Avena flavescescens)*

thrives in meadows and pastures, and on hills, in a calcareous soil, where it flowers in June and July. It is a coarse grass, and, though tolerably sweet, is much inferior to the meadow (poas) and fescue-grasses; the late Dr. Withering has asserted, that it is not relished by cattle, though Mr. Swayne thinks it one of the best grasses of this genus for the use of the farmer†.

7. *Flat-stalked or creeping Poa, or Meadow-grass, (Poa compressa)*,

flourishes in very dry situations, and flowers from June to August. This grass is, in Dr. Anderson’s estimation, the best and most valuable of all the poas; its dark, saxon-green leaves are compact and succulent, and grow so firmly together as to form a pile of the richest pasture-grass. Its flower-stalks vegetate throughout the summer; and, even when decaying, the leaves retain their beautiful green colour. It produces a fine turf in parks and lawns; and imparts a delicate flavour to the flesh of sheep and deer, to which animals it is peculiarly grateful.

* Young, in “Communications to the Board of Agriculture,” vol. iii. p. 146.
† Gramina pascua.
8. **Timothy-grass** (*Phleum pratense*).  
All the agriculturists and travellers of America concur in giving this grass the highest commendations, as being the chief support of cattle wherever meadows are found. The Rev. Mr. Young has made several trials of keeping it closely fed by sheep, upon a moist loam, and a clay marl bottom. The success was sufficiently encouraging to evince that this plant is deserving of attention; especially as its seeds may be easily procured in any quantity from America, at the price of about one guinea per bushel; which, he observes, is enough, in conjunction with other grasses, for four or five acres of land. He observes that four pounds (the proportion per acre fixed by Bartholomew Rocque, by whom this grass was first introduced into England) are much too little; and is of opinion, that timothy is best adapted to moist loams, especially peat*.  

9. **Yarrow** (*Achillea millefolium*)  
is one of the most common and valuable plants growing in this island; though a few years only have elapsed since its merits were announced by that excellent practical agriculturist, Dr. Anderson. It is found on moist loams, almost equally with dry, burning gravels, sands, and chalks. It possesses the singular quality of resisting drought on the most arid soils; so that if a green spot appear in a burnt-up, close-fed pasture, it may be almost certainly concluded to be covered with this plant. Five shillings per bushel are given for gathering its seed in October. Yarrow is found in the best bullock-pastures, where it is highly grateful to every description of cattle, particularly to sheep, which bite it as fast as it grows; so that, on tolerably well-

*Young, in "Communications to the Board of Agriculture," vol. iii. p. 146.
stocked pastures, it is rarely suffered to come into flower. It is suited to almost every soil, flowers in June and July, and is a plant every way deserving of attention*.

10. Rib-grass (*Plantago lanceolata*).

On rich sands and loams, this plant produces a considerable herbage; and, on poorer and drier soils, it answers well for sheep, though it is inferior to some others. Mr. Marshall states, that it has stood the test of twenty years' established practice in Yorkshire, and is in good estimation; though it is not well affected by horses, and is bad for hay, on account of its retaining its sap. Linnaeus remarks, that it is eaten by sheep, horses, and goats, and wholly refused by cows; though the astonishing richness of the milk in the celebrated dairies of the Alps is, by the late eminent Baron Haller, attributed to the food obtained from this plant and the common lady's mantle (*Alchemilla vulgaris*, L.). Its seed is plentiful.

11. Cock's-foot (*Dactylis glomerata*).

Various opinions, unfavourable to the culture of this grass, have been held by eminent botanists and agriculturists, as being a very coarse, common grass, unfit for meadows or pastures, and rejected by cattle of every description. It is, however, in every point of view worthy of being cultivated in a separate state, on account of its uncommon luxuriance; being refused by cattle only when growing on rank soils, or in coarse patches. Mr. Pacey, already mentioned, has not omitted to notice the valuable properties of this grass: he has sown it largely, when laying down his lands. It is permanent: his cattle are very fond of it, and never reject it but in that rank state of growth in

* Young, in "Communications, &c." vol. iii. p. 146; and Anderson's "Essays on Agriculture," vol. ii. p. 252.*
which all other grasses seem to be disliked by them. It is a very general inhabitant of our pastures, rejecting only the extreme, not flourishing in very wet or very arid soils; it affords an abundant crop, springs early, and grows fast, makes excellent hay, and yields abundance of seed, which is not easily shaken out. It flowers in June.

AQUATIC PLANTS.

1. *Flote-fox-tail* (*Alopecurus geniculatus*) grows in meadows on the banks of the Severn, in places so liable to inundation that the other good grasses are expelled; and also in the moister parts of meadows, the hay of which is much esteemed for feeding cattle. It flowers in May and June, and promises to be a useful grass for newly-reclaimed morasses, or lands recovered from the sea.

2. *Flote-fescue* (*Festuca fluitans*) vegetates in yet moister situations than the flote-fox-tail; and may indeed be said to be amphibious, as it sometimes grows in the water, and sometimes in moist places on land. This grass flowers in June, and is a constituent part of the celebrated Orcheston meadow: horses and cows eat it with such avidity, as often to endanger themselves to obtain it. It springs early, and promises to be useful for the same purposes as the flote-fox-tail. The Cheddar and Cottenham cheese, in a great measure, derive their celebrity from this grass. These remarks are in every respect applicable to

3. *The Water Hair-grass*, (*Aira aquatica*), which is farther said to contribute much to the fine flavour of Cambridge butter, and consequently deserves to be better known. It is generally found on the edges of pools and standing waters, where it flowers in June and July.

* Tollet, in "Communications to the Board of Agriculture," vol. iii. p. 432.
† Ibid. p. 436.
‡ Ibid. p. 437.
4. Water-po\-a, or Reed Meadow-grass, (Poa aquatica),
is one of the largest and most useful of British grasses,
and forms a chief part of the riches of Cambridgeshire and
Lincolnshire, and other counties, where draining the land
by means of wind-mills has taken place. Immense tracts,
that used to be overflowed and produce useful aquatics, but
which still retain much moisture, are by the above process
spontaneously covered with this grass, which not only
affords a rich pasturage for the cattle in summer, but forms
the chief part of their winter fodder*. From its strong
stem and upright growth, it is calculated to remain unhurt
by inundations, and is suited to those low places, which
are so liable to inundation as to be unfit for the finer
grasses. It has a powerful, creeping root, and will admit
of frequent mowing: it flowers in July and August†.
This grass is particularly abundant in the Isle of Ely,
where it attains the height of six feet, though it is usually
cut when about four feet high; after it is dried, it is bound
up in sheaves, then formed into ricks, in which it under-
goes a slight degree of fermentation, that improves it. In
this state it is provincially called white lead, from its ac-
quiring a white surface when dry: the inhabitants of Ely
also term it fodder, by way of eminence, other kinds of
coarse hay being denominated storer. It is excellent food
for milch cows, but is not relished by horses‡. By cut-
ting it into chaff, Mr. Tollet thinks it will prove excellent
winter provender§.

* Curtis's "Flora Londinensis."
† Sole, in "Letters and Papers of the Bath and West of Eng-
‡ Ibid.
§ Communications to the Board of Agriculture, vol. iii. p. 437.
SECTION III.

Artificial Grasses.

In the course of the present work we have stated the various modes of consuming grasses to the most advantage; in the present section, therefore, it is proposed to give a concise notice of the best artificial grasses, or vegetables cultivated and considered in that light, and which are every way worthy of attention.

§ 1. Bush Vetch (Vicia sepium).

This vegetable grows in woods, hedges, pastures, and meadows, and flowers in May and June. It does not attain any great degree of height, seldom rising to four feet; but, as it possesses the valuable property of speedy growth after being cut, it promises to be a useful plant for pastures. It shoots earlier in the spring than any other eaten by cattle, vegetates late in autumn, and retains its verdure throughout the winter. The culture of the bush-vetch was recommended by Dr. Anderson* so long ago as in 1774, though it has not been much practised since that time, principally from the difficulty experienced in collecting the seeds; as the pods burst and scatter them about, and the seeds are frequently devoured by the larvæ of a species of *catelabus†. From experiments that have been made in regard to the culture of the bush-vetch, it is certainly worthy of trial. A small spot of garden-ground was sown with the seeds of this plant in drills, and Dr. Withering states, that it was cut five times in the second year, when it produced at the rate of twenty-four tons per acre of green food, which would be nearly four tons and a half

† Withering's "Botanical Arrangement of British Plants," vol.iii.
when dried. From an experiment likewise recorded by Mr. Swayne*, the produce of the hay, in part of a field wherein the bush-vetch naturally abounded, was twenty-four tons, eleven hundred weight, and three-quarters per acre, which is upwards of one-third more than is generally yielded by lucerne†.

§ 2. Burnet (Poterium sanguisorba).

This vegetable is chiefly used for early sheep-feeding, though it may also be cultivated with great advantage for soiling cattle. It is very hardy, being little affected by droughts in summer, or by severe frosts in the winter, and will even vegetate in that season. If it be reserved for the purpose of making hay, though its produce is in general abundant, it ought to be cut early, otherwise it will become coarse. In the culture of this plant, it is of great importance to have good seed, for which purpose a proper spot should be selected; and as the seeds shed when ripe, they ought to be cut in the morning while they are moist with the dew, and thrashed out on the same, or on the following day. Those who wish to save the seed should, according to Rocque, who first introduced the culture of burnet, feed the grass till May, otherwise it will be too rank and lodge. Burnet flourishes best on dry soils, and may be sown in April, May, June, July, and August; for sheep pastures it should be broad cast, or sown with the hand; for other purposes, it may be advantageously drilled. During the first year, it will require to be kept very clear from weeds, which may be effected by harrowing; for, being a strong, tap-rooted plant, the teeth of the harrow will not injure the roots: and, in the second year, it will become sufficiently strong to choke all other grasses.

† Ibid.
§ 3. Cichory (Cichorium intybus), also called cichory, or common wild succory, is a vegetable, the value of which, for feeding cattle, has only been known within a few years. On blowing sands, or weak and poor soils, Mr. Young thinks it superior to any other plant; and he observes, that if it be sown with a portion of burnet and cock's-foot-grass, it will form a layer for six or seven years, far exceeding those made with trefoil, rye-grass, and white clover. The best seed is undoubtedly that which is obtained by the farmer from the plants themselves; and, as they produce seed in great abundance, it may be easily collected by hand: but the mode of sowing varies according to the intention for which it is raised. Thus, for feeding cattle, it is usually sown in conjunction with oats, or other spring corn, at the season the latter is usually deposited in the ground; but for soiling it is sown alone, from the second or third week in March till the close of summer, the earlier the better, on account of the hardy nature of this herbaceous perennial; in general, the seed is broad cast, though Mr. Young thinks it best to be drilled alone on poor land, in rows, about nine inches, on better soil at twelve inches, asunder, after the soil has been duly pulverized; when sown, it only requires to be once lightly harrowed; but, if drilled, will be greatly improved by an occasional scarifying*.

Cichory is extremely luxuriant, far exceeding the produce of burnet, lucerne, or saintfoin, and therefore will admit of being often cut for soiling during the summer. For the first year, one or two cuttings or mowings will be sufficient; which may, in subsequent seasons, be repeated three or (Mr. Y. says) four times, beginning in April or May, and cutting every second month till October†. This

* Farm. Cal.
plant may also be made into hay, which, though coarse, is said to afford considerable nourishment; but its chief use is for soiling cattle during the summer months; and it is likewise excellent for sheep-feeding, receiving less injury from hard stocking than many other vegetables. The culture of cichory has been carried on to a considerable extent by the late Duke of Bedford, and by Messrs. Martin, Wakefield, and A. Young, sen. of whose interesting experiments we regret that our limits will not allow a detail*. Its culture has, we are informed by an intelligent American agriculturist, been likewise strenuously recommended to the notice of farmers in the Western Hemisphere, though we have not yet heard with what degree of success, or to what extent, it has been practised.


There are four species of clover usually cultivated, each possessing various degrees of value, but all of which are more or less useful in feeding cattle.

1. Common Clover (Trifolium pratense) flourishes best on firm soils, and is obtained by sowing seed, in the ratio of ten or fifteen pounds per acre, at various intervals between February and May. It is either sown in conjunction with spring corn, or (which is better on grass-farms) with ray-grass; and, if it be mown when the ray-grass is coming into blossom, the lower growth will be materially increased, and a very considerable quantity of excellent grass be obtained; beside which the clover will be effectually sheltered by the rye-grass from the consequences of severe frosts. The best modes of consuming clover having been already stated, we shall only observe, for the convenience of collecting its seed, that the common clover

* See "Annals of Agriculture," vols. xv. xvii. xx. xxviii. where numerous valuable accounts of the culture and application of this plant are given.
is in flower from May to September, and that the ripeness of its seeds may be easily ascertained by the stalks and heads changing colour.

2. Hop-clover, or hop-trefoil, (T. procumbens), grows naturally in dry meadows and pastures, and flowers in June and July. It has lately been strongly recommended to the attention of agriculturists by Mr. Amos, inventor of a new and useful drill-plough, for laying down land to grass: when mixed with the preceding species, on light soils, it affords a most excellent fodder.

3. Red perennial Clover, or Cow-grass, (T. medium), better known by the name of marl-grass, continues longer in the land than the common clover, and vegetates spontaneously on marly soils; though it has been cultivated with the happiest success on sandy, loamy, and heavy clayey lands. The time for sowing it is from the middle of April till the second or third week in May. This sort, as well as the common clover, is sometimes sown with flax on very highly-cultivated soils; and, as flax is a forward plant, it may in general be removed sufficiently early to allow the clover time for growing. Red perennial clover, however, rarely succeeds when sown by itself, as it will not withstand the severity of winter without some kind of shelter. It produces abundance of seeds, which may be easily collected, and is more frequently employed for laying down land to grass.

4. White or Dutch Clover (T. repens) is by no means a lasting plant on wet or swampy, loamy, or clayey soils; but on dry, sandy, loamy soils, it will thrive with great luxuriance, especially if it be often rolled. This sort is preferred for sheep-walks, and when closely fed down is of very great utility; it is usually sown with red clover, ray-grass, or barley, and on dry soils produces most excellent hay.
§ 5. Lucerne (Medicago sativa)

is of French growth, but was introduced into British husbandry about the middle of the seventeenth century; it flourishes most luxuriantly in deep, rich, friable loams, though it will also thrive in any good, dry soil, and in the coldest climate; but the soil must be kept as free as possible from weeds, otherwise its luxuriant growth will be greatly impeded. In order, therefore, to clean the land, Mr. Young, sen. recommends two successive crops of turnips or carrots, as the most successful preparatory step; but, in case a fallow be preferred from convenience, a person ought to follow the ploughs, harrows, or extirpators, and collect all weeds for the purpose of a speedy removal. It will be necessary to give the soil three ploughings, and as many harrowings, in the second spring before the lucerne is sown, that it may become as fine as possible; manure is not essential to its culture; but, if used at all, it should be spread with the first crop of carrots or turnips.

Lucerne may be either broad cast or drilled, or propagated by transplanting; all of which methods have been successfully practised. The proper season is towards the middle or end of March, or not later than April; because, like the turnip, lucerne is subject to the ravages of the fly, and by early sowing it will attain a sufficient degree of growth, so as not to be affected by the devastations of the insect. If broad cast, twenty pounds of seed (which should if possible be new) will suffice for one acre; if drilled, six pounds will be enough; if the seed be deposited in equidistant rows of two feet. The value of lucerne-crops will be greatly increased by sowing with oats, which Mr. Young prefers to any other grain, in the proportion of six pecks of the latter per acre for very rich land; of two bushels for indifferent soils; and of three
bushels for poor soils. As soon as the grain is sown and harrowed, the lucerne should be sown, and a light harrow be passed over it, whether drilled or broad cast. Where, however, lucerne is sown with the view of being transplanted, the seed should be deposited in the ground early in the spring alone, and be carefully hand-hoed till August, when they will be sufficiently large to be transplanted; after which they will require but little attention till the following year, excepting that it will be advisable to hoe the transplanted crops once or twice during the intervening period.

The expense of cultivating lucerne is very considerable, and should not be incurred by the young farmer without much reflection; though the great profit it affords is certainly no mean inducement to attempt its culture. The expense of drilled lucerne, Mr. Young computed (in 1796) for the first year to be as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two spring ploughings, extra</td>
<td>£0 18 0</td>
</tr>
<tr>
<td>Harrowing</td>
<td>o 2 6</td>
</tr>
<tr>
<td>Eight pounds of seed</td>
<td>o 3 0</td>
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<tr>
<td>Drilling</td>
<td>o 2 6</td>
</tr>
<tr>
<td>Horse-hoeing in autumn</td>
<td>o 3 6</td>
</tr>
<tr>
<td>Hand-hoeing in ditto</td>
<td>0 5 8</td>
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<tr>
<td><strong>First year</strong></td>
<td><strong>£1 18 6</strong></td>
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**ANNUAL.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>Rent, Tythe, and Rates</td>
<td>£1 10 0</td>
</tr>
<tr>
<td>Four horse-hoeings</td>
<td>0 10 2</td>
</tr>
<tr>
<td>Three hand-hoeings</td>
<td>0 12 0</td>
</tr>
<tr>
<td>Five mowings</td>
<td>0 12 6</td>
</tr>
<tr>
<td>Raking together</td>
<td>0 5 0</td>
</tr>
<tr>
<td>Loading and carting home</td>
<td>0 7 6</td>
</tr>
<tr>
<td>Manuring, to the annual</td>
<td>0 12 0</td>
</tr>
<tr>
<td><strong>Total amount</strong></td>
<td><strong>£ 4 9 2</strong></td>
</tr>
<tr>
<td>Clear profit</td>
<td><strong>£ 14 7 6</strong></td>
</tr>
</tbody>
</table>
Mr. Young remarks, that the expence of raking, mowing, and carting cannot be easily calculated, unless the quantity cultivated be sufficiently large to furnish employment for a man, boy, and horse; and that, though he has estimated the cost rather high, yet it is not perhaps exaggerated, if the loss of time necessarily consequent on inadequate employ be duly considered. He would, therefore, fix the annual expence at 5l. as he thinks an acre of land cannot be cultivated for less, even under the most excellent management*.

But, notwithstanding these heavy expences, lucerne has, upon the fairest trials, been found fully adequate to them; and Mr. Young observes, that, if the value of the food be computed according to the maintenance of cattle per week, it will pay nearly cent. per cent.

The first use of lucerne is for soiling horses, or other cattle, from three to five of which may be supported by the produce of an acre during the six summer months; the lucerne being cut twice a day, and given in a fresh state to the cattle. For fattening bullocks, also, Mr. Young thinks this plant well calculated: the experiments made with this view, indeed, are not numerous, though they evince that lucerne is, in this point of view, far superior to tares. This vegetable has also been successfully employed in soiling sheep and hogs; and, as the latter do not feed down so closely as the former, Mr. Y. thinks they may be admitted upon lucerne plantations with safety; and that a small field planted with it, near the farm-yard, "would be of admirable use and profit." Lucerne is also made into hay, but this management is less profitable than that of soiling cattle with it in a green state. Where, however, it is to be made into hay, it should be so cut, and the swaths so exposed as to dry quickly without shaking about more than is absolutely necessary; as the

* Annals of Agriculture, vol. xxv.
leaves will be less liable to be separated from the stems, and the hay is consequently of more value.

§ 6. *Saintfoin (Hedysarum onybrichis)* vegetates, with uncommon luxuriance, on dry, chalky soils, where it flowers in June and July. The best seed has a bright husk, the kernel being plump, externally of a bluish or grey cast, but, when cut, internally of a fresh greenish colour.

Saintfoin requires a clean soil; the seeds should be *fresh*, and sown towards the close of February, or early in March. The quantity varies from four to eight bushels per acre, broad cast, according to the nature of the land; though four bushels are, in general, fully sufficient: in the drill-culture three bushels are enough. Saintfoin, indeed, is sometimes sown with barley, or with clover, in the proportion of from one to three bushels per acre, with the addition of five pounds of *trefoil*, which last is said to check the growth of weeds till the saintfoin has taken deep root. During the first year, no cattle ought to be allowed to graze on it, as their feet will injure it; nor should it be fed down by sheep the succeeding summer, as they are apt to bite the tops of the roots, the growth of which would be immediately checked. In the following summer, a crop of hay may be made, and the after-math fed down with cattle of any description, excepting sheep, for the reason above assigned. At the end of seven or eight years, the soil should be manured with dung; or, if it be sandy, with marl.

In case the first season for mowing prove wet, the saintfoin ought to be left for seed: it should, however, on no account be cut before it is in full bloom, as the quality of the hay would thus be materially injured; but, if cut and given to cattle in a green state, it will produce a second crop in the same year. This plant is chiefly con-
sumed in the form of hay; but, whether thus used, or employed in soil ing, it is from its great succulence equally valuable for feeding cattle, and especially horses, which are asserted to be materially strengthened by it, without the aid of oats. It ought, however, to be remarked, that saintfoin, though it increases the quantity, does not, in the opinion of some farmers, improve the quality of milk in cows; while by others it is asserted, not only to make the cream richer, but also to give the butter a better colour and more delicate flavour.

Swampy soils are by no means congenial to this plant; but, as there are numerous dry, stony wastes on which it will grow, it certainly deserves to be more generally introduced into culture, especially as it will produce, on the worst lands, at least one ton of hay, together with a considerable after-math.

§ 7. *Spurrey* (*Spargula arvensis*).

The common, or corn spurrey is an indigenous vegetable, flourishing in corn-fields and sandy situations, where it flowers from July to September. Its culture has hitherto been but little, if at all, practised in this country; though, from the avidity with which it is eaten, it deserves to be more generally known, being peculiarly calculated to fatten sheep, as also to increase the milk of cows. Further, spurrey continues green till a late period in autumn and often throughout the winter, on which account it has long been cultivated in Flanders; we have, therefore, been induced to recommend it to a fair trial by practical agriculturists.

§ 8. *Tares* (*Vicia*).

There are two varieties of the common tare (*V. sativa*), called the spring and winter tares; the former of which is less hardy than the latter. The spring tare is usually sown
about the end of March, or early in April; and the winter tare in September (the earlier the better), in the proportion of from eight to ten pecks per acre, broadcast: for the drill culture, half that quantity will be sufficient. Both these varieties are of very essential service in soiling cattle of every description; especially the winter tare, which comes into use just as the turnip-crops fail, and affords a succulent food to ewes and lambs. Tares are rarely made into hay, on account of the great loss they are liable to sustain from wet, as well as on account of the more than usual care requisite in making them into hay. In Gloucestershire, the winter tare is cultivated as pasturage for horses, and is eaten off so early as to admit of turnips being raised the same year. They produce abundance of seed, which the farmer will do well to collect, and keep separately, from the great resemblance which the seeds of the two varieties bear, so that they are liable to be often mixed.

There are a few other species of tare or vetch worthy of the agriculturist’s attention, viz.

1. The Strangle Vetch, or Tare, (V. lathyroides), which abounds in chalky and sandy soils. Its culture has lately been strenuously recommended by Mr. Amos; it affords a tender and agreeable food to sheep.

2. The Tufted Vetch (V. cracca) attains a considerable height, and produces abundance of leaves. This sort, which flowers in July and August, as well as the wood vetch (V. sylvatica, which rises from two to four feet high), is said to restore weak or starved cattle to their strength more speedily than any other vegetable hitherto discovered.

3. The Broad-leaved Vetchling, or Everlasting Tare (Lathyrus latifolius), has hitherto been raised in gardens, chiefly for the sake of the fine flowers. It often attains to the height of ten or twelve feet, and produces abundance of foliage. It is eaten most eagerly by cattle, and was several years since recommended to the attention of farmers.
VEGETABLES FOR FODDER.

by Dr. Anderson, as promising to afford a large crop of hay; though it appears hitherto to have met with little notice, in an economical point of view.

SECTION IV.

Vegetables best calculated for Fodder.

Having already pointed out various economical modes of consuming root and other crops of vegetables, by way of fodder, we now proceed, according to the intimation given in a former page, briefly to state the culture of such plants as are peculiarly calculated to supply the farmer with sufficient food for his cattle stock during the trying seasons of the year.

1. Jerusalem Artichoke (Helianthus tuberosus, L.) is a hardy, bulbous-rooted exotic, the culture of which, though at present little regarded, except as a culinary article, deserves to be more generally known. Its stalk often attains the height of nine feet. This plant produces no ripe seeds, but is easy to be propagated by the roots; which, when once planted, continue to vegetate in the same soil without the aid of manure, or being in any degree affected by the rigour of our winters. The roots are particularly useful for feeding swine, and uncommonly productive. One spirited cultivator found its produce to be about 480 Winchester bushels per acre, without manure. Another (Mr. Peters) has stated, that he obtained between seventy and eighty tons from one acre; and he is of opinion, that seven acres will produce 396 tons, which will keep 100 swine for six months, allowing each head fifty-six pounds per day, at an increase from 10s. to 15s. in value, especially if the Jerusalem artichokes be boiled in sweet hog-wash*. If these roots be given to horses, they ought to be previously cut

* Winter Riches, p. 48.
and ground in an apple or cyder-mill; the allowance per head is eight pounds, with two ounces of salt and a bite of hay, given three times in the day. As the Jerusalem artichoke will flourish on almost any soil, and its culture is by no means difficult, being the same with that of potatoes, it might be very profitably raised in many barren and at present unoccupied wastes: no other precaution, for preserving its roots during winter is necessary, except the digging of a ditch "round the plant, to prevent the water from injuring them." For this useful fact, we are indebted to Mr. Legaux, an intelligent agriculturist of Spring-Mill, Pennsylvania, who had artichokes, raised from Dutch seed, eight and nine inches in diameter.

2. The common white Beet (Beta hortensis), though chiefly cultivated in gardens for culinary purposes, is, according to Rocque, a most excellent fodder for cows; the best way of feeding them being, to mow the plant, and to give it to them during the summer. It is raised from seed, which should be sown in the beginning of March, on an open spot of rich ground, in a low situation, and may be occasionally watered. As it is of essential importance to have the soil properly cleansed, three ploughings will be necessary, after the third of which the ground should, be carefully harrowed, and a rake, with teeth from nine to twelve inches asunder, be drawn across it, so as to mark lines; and these again must be crossed by others transversely. If the seed be fresh and sound, one will be sufficient; though, if doubts be entertained of its purity, two may be dibbled about the depth of one inch, at each point where the lines meet. All weeds ought carefully to be eradicated; and, when the plants come up about a finger's length, they should be divided, and transplanted, in moist weather, to other beds. The chief obstacle to the extensive culture of this plant appears to be, the minute attention required in manuring and dressing the land, by which much labour is
incurred. To obviate this, the celebrated French agriculturist, M. de Chateaurieux, made an experiment to raise the beet according to the new husbandry: he, therefore, sowed it on a bed forty feet long by six feet wide; where the plants were too thick, they were thinned so as to leave a space of fourteen inches between each. On digging up the roots in October, they were all nearly five or six inches in diameter. The harvest generally begins about the end of September: the roots must be dug up with great care, and the leaves and stalks be cut off, to prevent them from growing, but so as not to injure the roots.

The Mangel Wurzel, or Root of Scarcity, \((B. \text{albissima}, \text{L.})\) is a variety of the \(B. \text{cicla}\), an exotic species of the beet, concerning which the highest expectations were formed in Britain some years since, respecting its usefulness as an article of fodder; though these hopes have not been fully answered, it certainly will furnish an excellent article of fodder, in particular situations; especially to cows, to whose milk and cream the mangel wurzel imparts a delicate flavour. On some parts of the continent, this vegetable is preferred for feeding cattle to every other root-crop, its roots and leaves not being subject to the depredations of insects; but it must be confessed, that the root of scarcity does not fatten so speedily as potatoes, turnips, or any other roots. Its abundant foliage may be given with much advantage to horses, sheep, cows, and swine; but, for the two last, the leaves should be separated from the roots, as cows and hogs are asserted to refuse to eat them fresh from the plants. The seed of the mangel wurzel should be dibbled in the month of April or May, in the same manner as the beet, but in holes from eight to eighteen inches apart.

3. Borecole (a species of cabbage) is a hardy plant, which promises to be of excellent service to the grazier; as its leaves may be cut without impeding its growth, and it will,
in the course of five or six weeks, produce a new crop, while the severest frosts do not affect it. Its culture corresponds with that of the cabbage, which will be hereafter specified, but requires to be raised in clean and well-manured soils, and to be constantly hoed, by which means it will vegetate with uncommon luxuriance. It is particularly calculated for feeding sheep; but these animals ought not to be pastured so long upon the borecole as to injure its stalks, otherwise its future growth will be greatly checked, in consequence of its being deprived of the sprouting leaves.

4. Burnet. See the preceding section, p. 455.

5. Cabbage (Brassica, L.)—Of this valuable plant there are several species cultivated in Britain; the sorts most deserving of notice are, 1. The B. rapa, or turnip-cabbage, the culture of which is the same as that required for the common turnip. Its seed should be first sown on a spot of clean land, two perches of which will supply plants enough for one acre: it is eminently calculated to resist the severity of winter-frosts, and is much relished by cattle.—2. The turnip-rooted cabbage is a very hardy variety of the common cabbage, the seed of which is sown in June, in the same manner as the preceding species; though, if they run too much to stalk, they ought to be speedily transplanted. This sort affords an excellent fodder for oxen, cows, swine, and horses, for the feeding of which it is chiefly cultivated.—3. The drum-headed cabbage is also a variety of the common cabbage. Its seed is deposited in beds, either about the end of February or early in March, or sometimes in August; in which case the plants are set out in November, and transplanted in July. This kind is much relished by cows and ewes, and is said to fatten cattle six weeks sooner than any other vegetable; but only the heart should be given to cows, because the leaves (which may without injury be given to other cattle) impart an unpleasant flavour
VEGETABLES FOR FODDER.

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to the milk, cream, and butter of those cows which are fed with them. Should, however, any of the leaves be accidentally given to any cows, the addition of one gallon of boiling water to six times that quantity of milk, when this is exposed in the leads or other shallow vessels, will effectually remove the disagreeable taste.—4. The green Scotch cabbage is likewise a very hardy variety, introduced from North Britain, where it is an article of prime importance for cattle-feeding. It possesses this singular advantage, that it will grow on moor-lands; and, if it be cut a short time before the winter frosts set in, it is so well relished by cattle in general, that it is asserted, they will rarely taste any other.

All the species and varieties of cabbage are subject to the depredations of numerous insects; in its early growth to the ravages of the turnip fly, and in a more advanced state to those of the cabbage-fly (Papilio brassica, L.) The strewing of the soil with soot will, according to the late eminent botanist, Dr. Withering, effectually drive away the turnip-fly; as the whipping of the plants with green elder twigs, or boughs, will secure them from the attacks of the cabbage-fly. To prevent the approaches of caterpillars, it has been suggested to sow the borders of the intended cabbage plantation with hemp; and the mixing of one ounce of flour of sulphur with half a pound of cabbage seed, in a pot closely covered for sowing, will, it is said, produce similar effects. Another successful expedient for preserving young cabbages, previous to transplanting them, is to sow the seed in a box, elevated a few feet above the ground; this has been, as yet, practised only by one or two intelligent agriculturists in America. It is a question, whether it is best to transplant cabbages, or to set the seeds in the spot, and at the proper distances, where they are to grow; by the last-mentioned method, they are said to escape being stinted in their growth by transplanting; but,
upon the whole, we are inclined to prefer the removal of the cabbages from the seed-beds, otherwise indeed they are liable to be too tall, and to have crooked stems. Moist weather is peculiarly favourable for this purpose; and the holes should be filled with suds (which are, in this case, better than clear water), unless the soil be naturally very moist; and Dr. Darwin has remarked that, in transplanting cabbages, it is best to pluck and not to dig them up, as by that means more of the root-fibres are torn off, and the plants become almost totally oviparous.

6. The carrot (Daucus carota, L.) is raised from seed, which ought to be previously well rubbed in the hands, to divest them of their beards, as they are liable to adhere together, and will come up in patches. They flourish best in light, sandy loams, which ought to be well loosened by frequent ploughing and harrowing, in order to facilitate their growth; and are best after turnips, because these roots render the soil more free from weeds than any other vegetable crop. When broad cast, they will require to be thinned out to the distance of half a foot asunder, and should also be hoed, in order to give every possible facility to their growth; after they have been thus hoed, a harrow is sometimes passed over them with the same view, and without any injury to one plant, perhaps, in fifty. After harrowing, however, it will be advisable to go among them, and uncover such of the roots as may be buried under heaps of mould. For cattle of every description, carrots supply an excellent and nourishing food; and, as far as respects the amount of their produce, and their freedom from the ravages of vermin, they are greatly superior to turnips; but, as they will not withstand the winter like cabbages, if left in the ground, the following mode of preserving them has been suggested, and successfully practised, by some agriculturists. Soon after Michaelmas, during dry weather, let the roots be dug up, and piled upon an earthen
bank, raised about six inches above the level of the soil, and adapted to the quantity of carrots intended to be stored. On this is then to be spread a thin layer of dry straw, and on this the carrots are to be placed, two or three deep, with successive intervening strata of straw; the tops being turned outwards, and their ends folding one over another, while the smaller roots are top and thrown into the centre. The stacking may be continued to the height of about four feet, when the whole is covered with an additional quantity of straw, and thatched with sedge. Another line is then commenced in the same manner, leaving room for one to pass between; and the interval is next filled up with dry straw, and the outside defended with bundles of straw staked down, or fastened with hurdles. Thus arranged, carrots will be effectually secured from frost, and afford a regular supply of wholesome fodder at a time when almost every other vegetable is destroyed*.

7. Parsnips, (Pastinaca sativa, L.) though refused by cattle in a wild state, afford, when cultivated, an article of food; which, from recent trials, appear to be superior to almost any other root for fattening oxen, and especially swine, as well as for improving the quality of milk. The seed should be sown either in autumn, immediately after it is ripe, or in February or March, otherwise the growth of the plants will be impeded by weeds. If broad cast, parsnips require to be thinned to the distance of ten or twelve inches apart; if dibbled, the seed should be deposited in rows eighteen inches asunder, and ten inches distant one from another in those rows. They should be horse-hoed twice, and, after the second hoeing, be earthed up, though not so as to bury the leaves. The parsnip flourishes best in rich, deep loams, though it will do well on sandy soils.

8. Buck-wheat (Polygonum fagopyrum, L.) vegetates

with great luxuriance in dry, loose, and sandy soils, that are open to the effects of the sun; though the variety known by the name of Siberian buck-wheat, which is much heavier and more palatable in the grain, will thrive in the poorest soil, and is not at all affected by cold. The best, and indeed the proper, season for sowing it is, towards the end of May, or the commencement of June; and, in the course of a week, it generally appears above the ground: the quantity is from one to three bushels per acre. Buck-wheat requires little or no manure; on the contrary, when ploughed down in a green state, it greatly ameliorates the soil, and, if suffered to attain to maturity, affords an excellent food, either for soiling or for winter store. Given to horses employed in slow draught, in conjunction with bran or chaff, whether the seeds be in a whole state, or bruised in a mill, it will put them into fine condition; in a recent or green state, it greatly increases the quantity of milk. The seeds of the buck-wheat are excellent for fattening poultry and swine; but the last-mentioned animals should, if possible, be kept from eating the whole vegetable, as it is asserted, not only to intoxicate them, but also to cover them with scabby eruptions.

9. Furze, (Ulex Europaus, L.) though by many regarded as a noxious weed, may be advantageously cultivated in light, sandy soils, by sowing its seed in February, March, or April, or at all events early in May, in the proportion of six pounds per acre. In the month of October, or perhaps a little earlier, in the following year, it may be mown, when it will continue till Christmas, and be fit for use till March. Furze requires to be bruised in a mill before it can be eaten by cattle, but it is very invigorating; and if given to horses, after being recently bruised, they will, it is said, prefer this shrub to hay or even to corn. It will continue growing for several years, producing from ten to fifteen tons per acre, which are, in some districts, consi-
VEGETABLES FOR FODDER.

10. Rye (*Secale cereale*, L.) Of the common rye there are two hardy varieties, spring or white rye, and winter or black rye, the former of which may be sown from February to March, and the latter from the middle of September to the close of October. The quantity of seed per acre is from two bushels to two bushels and a half, Winchester measure, on poor, sandy, or dry lime-stone soils. On farms where wheat forms part of the rotation of crops, both the spring and winter rye are advantageously sown, in the proportion of one peck of rye to one bushel of wheat. Rye may likewise be harrowed in with a thin crop of turnips, and both be fed off with sheep. Either for pasturing or for soiling, rye supplies an excellent article of food to sheep as well as to horses and cows; the former may be fed off with it in the spring, the latter somewhat later. It is not, however, cultivated to any considerable extent, from its being liable to the depredations of an insect, that causes it to become horned or spurred, in which state it is very pernicious to cattle.

11. Oats (*Avena sativa*, L.) There are several varieties of the common oat, all of which are eminently calculated for cold, poor, and dry soils, as well as marshy ground, or land newly broken up.—1. The red or brown oat ripens early, and does not shed its seed: it is very useful for feeding cattle, as its variety, the Peebles oat, which will stand on any exposed or mountainous districts, without being injured by the severity of the weather. 2. The white oat also attains early to maturity; though its variety, the Angus oat, is less forward in ripening, it requires a drier soil than either of the preceding articles. Or 3. The black oat, which is chiefly cultivated in North Britain.—All these varieties are raised from seed, the proper season for sowing which is from the middle of February to the
commencement of June; the quantity per acre, if sown alone and broad cast, being from three to six bushels, to which are sometimes added one bushel of darnel or rye-grass and twelve pounds of clover. The seed is then harrowed in, and requires but little subsequent management. Oats may likewise be advantageously drilled, though this practice, as far as it respects them, has not hitherto been carried on to any great extent. Beside the indigenous varieties already noticed, there are a few foreign species worthy of notice, and which will withstand the severity of a variable climate, viz.—1. The Poland oat, together with its variety, Church’s oat, first raised in Scotland, require a very rich soil; both ripen early, and easily part with their grain when ripe: the quantity sown is seven or eight bushels per acre, in March or April.—2. The Friesland oat, to which the same remarks apply: the quantity per acre is about six bushels. These two species are raised chiefly for feeding horses.—3. Skegs (Avena stipiformis, L.) will vegetate luxuriantly on the poorest soils. This species is said to be a very wholesome food for, and is much relished by, horses, cows, and ewes before they yeal their lambs, especially when given with the straw, either in a whole or in a chopped or bruised state. Oats are liable to the smut, a disease common to most kinds of grain, and which is believed to originate from the depredations of an insect. The most likely preventive is, to wash the seed gradually and repeatedly in a sieve, in running water, till all the light grains are separated; or, it may be advantageously steeped in diluted vitriolic acid, in the proportion of one gallon of the acid to about thirty gallons of water. They are likewise subject to the depredations of a grub, which begins its ravages early and continues till May or June, when it is transformed into a chrysalis, and at which time only it is vulnerable. At this season the refreshing vernal showers destroy immense numbers; in fact, all but such as may have
taken shelter in the coarse and luxuriant weeds usually found in ditches and on banks, or in soft and dry molehills, whence the eggs of the vermin are conveyed by the air or wind into the field. The only probable preventive is to remove all such rubbish from the vicinity of the oatfield; and consequently, the insects being deprived of their shelter, will be exterminated by the winter rains.

12. Peas (*Pisum sativum*, L.) There are many varieties of peas cultivated, which it is not necessary here to specify; as the principal sorts for field-culture may be reduced to two, the white and grey. The proper season for sowing the white pea is from the end of February to the first or second week in March, in a light soil, with about two bushels and a half of seed for the large sort; the grey pea, from the end of January to nearly the middle of March, on a strong soil, with about three bushels of seed per acre. The drill-husbandry is most easy and certain; and the seed should be put in double rows, about fifteen inches asunder, with an interval of about thirty inches distance between the double rows. The wide intervals should be cultivated with a small plough, or cultivator, the narrow ones with a hand-hoe; and when the plants are advanced, and before they fall down (for peas, being weak, climbing plants, are liable to fall on the ground according to the common broad-cast husbandry) by earthing up the rows a little, they will lean towards each other, unite and form one row, and thus be supported, so as to blow and form their pods without falling on the ground. The distances here specified are calculated for the earlier and smaller sorts of peas; the larger kinds will require more room between the double rows, and, if the farmer should not be provided with a drill-plough, he may sow his peas thinly by hand into every second furrow after the plough. It should be observed, that one-third less of the quantity of seed above stated will suffice for the drill-culture; but, as
Peas are liable to be worm-eaten, especial care should be taken to sow only good, sound seed, otherwise the crops will of necessity be scanty and indifferent in quality. This kind of pulse may be sown after turnips or clover, upon one ploughing; but are best after a winter fallow, and the land in good tillth. When peas are cut, they should be laid in small heaps, and be frequently turned with a fork, being very apt to receive injury, and sprout by lying on the ground, without being often turned; and great care is necessary in turning them, to prevent the pods from shedding.

Peas are chiefly used in fattening swine; and, when bruised and given to cows, in conjunction with other succulent meal, they are said to give a flush of milk. Their haulm, if carefully sown in a favourable season, affords a wholesome fodder to neat cattle.

13. Beans. The sort of beans usually cultivated for feeding cattle is the horse-bean (Vicia faba equina, L.) of which there are several varieties; the large ticks or negro beans, the small ticks, and the common sort. They will all grow under the same system of culture, only requiring more or less room according to their size. Beans are more hardy than peas, and also a more certain crop; but they require much nourishment, and the soil ought to be well manured for them. They may be cultivated in the same manner as peas, and likewise on three feet ridges, and thus they are easily kept perfectly clean with the horse-hoe and hand-weeding; hoeing the ridges alternately. This is a much better and cheaper way of cultivating beans than the common way, upon the level ground. The quantity of seed necessary is about a bushel and a half of common beans upon an acre, which should be drilled about four inches deep the latter end of January, and thinned to about three inches distance in the rows, leaving the most promising plants. They should be frequently horse-hoed,
and near to the plants; and the slips of earth left next the rows by the hoe-plough should be hand-hoed, and the rows hand-weeded. Thus great crops may be obtained from the common sort, and the land brought in fine order. There is a further advantage in this way; that less manure is necessary to a crop of beans thus cultivated, than if planted upon the level, and hand-hoed. The sun and air is likewise more freely admitted among them; and, as they do not grow so tall as when close planted, they blossom and produce pods almost down to the ground; whereas the tall, close beans, produce them only near the tops of the stalks. The close-planted are also infested with the dolphin-fly, but not those which are drilled on ridges.

14. _Lentils_ (Ernum lens, L.) may be sown in the quantity of one and a half or two bushels broad-cast; or they may be drilled in rows eighteen inches asunder, for the convenience of cleaning the intervals with the Dutch hoe. Sometimes the lentil is put in the ground, with the proportion of two bushels of oats, or one bushel of barley; but whether thus cultivated, or grown alone, they ought to be cut while in full sap; because, when well dried and preserved, they afford a wholesome fodder to cattle, especially to cows, the quantity and quality of whose milk they materially increase; and also to swine, which will very speedily fatten on them.

15. _Of Potatoes_ (Solanum tuberosum, L.) There are several varieties cultivated for culinary purposes only, while others are raised solely for the purpose of feeding cattle-stock during the winter, for which purpose these roots are admirably calculated when properly sliced and steamed; of this last description are the Surinam or hog-potatoe, the Howard or clustered potatoe, the ox-noble, red, and Irish purple potatoes. All these sorts flourish with great luxuriance in light, loamy, sandy soils; though they will grow in any tolerable land. The ground ought to be pre-

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viously ploughed twice or thrice, and just before the last ploughing, a good quantity of rotten dung should be spread, and ploughed down early in March, if the weather be open; but if it be frosty, that business should be deferred till the end of March, or the beginning of April. After the last ploughing, the ground should be leveled, and furrows be made about three feet asunder, and seven or eight inches deep. In the centre of these furrows are to be set the entire roots, eyes, slips, or rinds (for all of these have been successfully planted, and have produced excellent crops), which should be covered with earth; and, a little before the young plants appear, it will be advisable to pass a light harrow over the whole, to eradicate all weeds, and remove every hinderance to their growth. As the potatoes increase, they should be earthed up twice, which operation will greatly promote their growth.

Potatoes are subject to various injuries from insects, as well as to various diseases, of which none is more fatal than the curl, so called from its causing the leaves of the plants to curl, though agriculturists are by no means agreed as to the cause of it. And, as it would lead us into a wider discussion than our limits will admit, we shall only state, that the steeping of the sets for two hours in a strong brine, made of Whitster's ashes, is believed to be a preventive; so likewise is the raising of potatoes from new seed, changing the seed, or renewing the same sorts again from the same seed. The proper time for digging up potatoes is in autumn, when their stems and foliage are beginning to decay; this operation should be done in dry weather, after which the roots may be piled up in dry spots, in heaps resembling the roof of a barn, and thatched with straw, slightly covering them with mould, which is beaten down with a spade. Holes are sometimes made in the sides and on the top, to afford a passage for the air arising from the natural warmth of the potatoes, which may be
filled up as soon as the evaporation of steam ceases, in order to prevent them from being injured by frost or rain.

Beside their utility, when steamed, for feeding and fattening cattle in general, potatoes are particularly serviceable in fattening swine, though a little variation will be necessary in preparing the roots, where the animals are intended for bacon or hams; in which case equal parts of ground peas and boiled potatoes must be gradually mixed together; and it has been asserted, that eight bushels of the mixture will be sufficient to fatten an animal weighing twelve stone.

*Turnip.* The varieties of this root, most commonly cultivated for feeding cattle, are, 1. The *Norfolk*, or oval, common white stock; and 2. The *Ruta baga*, or Swedish turnip, which is a very hardy, succulent vegetable, much relished by cattle, and is in no respect injured by the severest winters. These roots will be reared to most advantage on light soils, consisting of loam and sand mixed together; the seed is sometimes broad-cast, but repeated experiments have shown that it is far better to drill the seed, in which case one pound will be sufficient, whereas the broad-cast method will require three pounds. The soil ought previously to be rendered as fine as possible; and if soot be applied by way of manure, it will, it is affirmed, effectually prevent the ravages of the fly. The time of sowing depends on the season of feeding off cattle with turnips; thus, for winter consumption (i.e. from December to February) the seed should be sown from the middle of May to the close of June; for spring feed (i.e. from February till May) the end of July or beginning of August will be sufficiently early. But the seed ought to be changed every year, or every second year at the farthest, as the turnips will otherwise degenerate; and it should be deposited at the depth of two and a half or three inches, in order that it may have the greater moisture, and in conse-
sequence vegetate so rapidly as to be speedily out of the reach of the fly*.

When turnips have five leaves, it will be proper to hoe them, and thin them out to the distance of six inches asunder, which operation should be repeated in the course of three or four weeks, or even earlier, if the weather be wet; and the turnips be then thinned to the distance of fourteen inches apart. The success of their growth also depends greatly on the removal of all weeds, for which purpose a horse-hoe will be found very useful; sometimes, however, it happens that, notwithstanding every attention that may be bestowed on the culture of turnips, several spots will remain barren and unproductive. To remedy these inconveniences, the implement represented in the annexed figure was invented, a few years since, by Mr. Cubitt Gray, an intelligent Norfolk farmer. The method of using his transplanter is as follows: the handle A is to be held with the left hand, and the short handle B drawn up with the right. The implement is then to be put over the root intended to be transplanted, and forced into the ground with the foot; then, after twisting it round, it should be carefully drawn up, so that the soil may adhere to the root. In the mean time an attendant, likewise furnished with a transplanter, should make a hole for receiving the turnip, which is to be conveyed thither in the first transplanter; and, the right hand being kept steady while the left is gradually raised, the root will be left in the hole undisturbed†.

* See figures and descriptions of two excellent turnip-drills.
† Bath Papers, vol. iv.
Having, in the former part of this work (pp. 125, 131), detailed various modes of consuming turnips in feeding cattle-stock, we shall conclude this outline of their culture with a brief notice concerning the depredations of insects, and diseases to which they are peculiarly liable.

1. The *anbury* is a large excrescence, which forms itself below the apple. It grows to the size of both hands; and, as soon as the hard weather sets in, it attains to maturity, becomes putrid, and emits an offensive odour. The cause of this disease is not known: some Norfolk farmers, indeed, attribute it to the too-frequent culture of turnips on the same land; but this idea is positively denied by Mr. Marshall, who enquires whether it is not caused by the devastations of a grub, that, wounding the vessels of the tap-root, diverts the course of the sap, which, instead of forming the apple, forms this excrescence. Should this conjecture prove correct, the depredations of the worm may probably be prevented by putting in soap-boilers' ashes, by way of manure, a short time before the seed is drilled.

2. The *black canker* is a species of caterpillar, thus denominated by Norfolk husbandmen, which commits very great devastations among turnips when the plants are in the state of growth termed *rough leaf*, that is, have formed considerable tops. The best method of destroying these insects is, to turn a flock of ducks into the field infested with them. This expedient was successfully adopted in 1784, by Mr. Coke, who purchased 400 ducks, and turned them on thirty-three acres of turnips, which they effectually cleared of the canker-caterpillar in the course of five days. There is no doubt but that, on a small farm, a less number might be advantageously kept for this purpose. As a preventive, indeed, we know of no certain expedient, unless perhaps the sowing of turnip-seed on land so highly manured as to advance the growth of turnips quickly into the
state of rough leaf long before the insect makes its appearance.

3. The fly, or black fly, (Crysomela oleracea, vel nemonrum, of Linn.) ravages chiefly the tender seed-leaves of young turnips, and, if not timely prevented, will completely destroy them. The sowing of turnip-seed between beans has been suggested as a preventive; as also has the addition of one-fifth part of radish-seed, rolled into the ground. Radish seed, however, is not in all cases a preventive, though we understand a Norfolk cultivator, some time since, received a handsome sum for divulging this remedy; for, we have been informed, that Mr. Dunning, of Blackwater, Hants, an eminent coach-master on the western road, and also an intelligent cultivator, tried the experiment of radish seed on seven acres of turnips, which were almost totally destroyed by the fly; while a contiguous field, which he had sown with turnip-seed and sulphur, escaped altogether unhurt. The proportion of flour of sulphur we would recommend, from experience of its good effects, is three ounces to one pound of seed, to be added in the following manner: put the seed and one ounce of sulphur into a glazed earthen vessel, and cover it closely down for twenty-four hours; at the end of that time, stir the mixture, and add a second ounce, covering it as before; and at the end of forty-eight hours mix the third ounce, carefully stirring the whole, that the seed may be properly impregnated with the sulphur. It is then to be sown in the usual manner, and will effectually keep off the vermin till the third or fourth seed-leaf is formed, which will acquire a bitter taste, and thus be secured from the ravages of the insect. Another efficacious remedy, which was adopted by the late Lord Orford, is the steeping of the seed in train oil the night before it is sown*; but, in this case, the seed should be drained from the oily fluid, and

mixed with finely-sifted sand or mould. By this treatment the roots will not acquire any ill flavour; and seven gallons of oil will, it is said, be enough to steep seed for sowing 200 acres. It is probable that this steep may prevent the attacks of the black-canker caterpillar.

4. Slugs are likewise great depredators on turnips; for extirpating which, some have recommended the rolling of the ground during the night, while these vermin are abroad; as also the strewing of lime in the evening, at the rate of fifteen bushels per acre. Geese and ducks may, as in the case of the canker (p. 469), be advantageously turned into turnip-fields; but the most expeditious means of destroying these vermin is the sprinkling of tar-water, by means of a watering pot or other contrivance, on the land, before as well as after sowing, which will prevent their depredations; and which, if poured on them, will occasion instantaneous death. Captain Shank* directs the tar-water to be made by pouring a sufficient quantity of tar into a barrel, and to fill it up with water, which, after standing two or three days, will become powerfully impregnated with the tar.

As turnips are of such importance to the farmer, grazier, and breeder, the most effectual mode of preserving them becomes an object of considerable moment; we shall, therefore, conclude this notice of their culture with a concise statement of the best means of keeping these roots. In the county of Norfolk, Mr. Marshall has recorded an instance of successful industry, in the preservation of turnips. A farmer having a close of turnips, which he could not consume fast enough to be sown with wheat, cut off the tops with a spade, gave them to his cows, and carted the roots into an adjoining new-made ditch, backing the cart, and shooting them in; he then covered them with a little straw, and over this with bramble *kids, or faggots, to keep the stock from them. Here the turnips continued till they

* Shank, in “Bath Papers,” vol. viii.
were wanted in a frost: the cart was then backed to the
ditch, and the turnips loaded with a fork. The roots in ge-
neral came out as sound as they went in, and were eaten
by his cattle as well as, or better than, fresh-drawn turnips.
Had the tops been deposited with the roots, they would,
Mr. M. observes, have produced a fermentation, and
spoiled the whole deposit*. It is not improbable but that
this practice may be extended to the preservation of tur-
nips in the spring; but this management, it should be re-
marked, is only capable of being adopted in dry, porous,
or sandy soils; in which, as suggested by an able agricul-
turist, pits or beds may be dug, about two feet in depth,
and of considerable breadth, in turnip-grounds, wherein
five or six layers of turnips may be put, with a little fresh
earth between each of them, the tops being covered with
straw†. Farther: turnips may be drawn, topped, and
carted into a spot contiguous to the home-stead, where
they may be stacked, without any loss of labour, by reason
of the ready supply they would afford for shed or straw-
yard bullocks‡. Lastly, after drawing turnips in February,
and cutting off their tops and tap-roots, (which may be ad-
vantageously given to sheep), they may, if the weather be
dry and open, continue on the soil for a few days; then
let a lay of straw be spread on the ground, and on this be
placed a bed of turnips, about two feet in thickness.
These alternate strata may be carried up gradually to a
point, the edges of the straw being carried to a point, to
prevent roots from rolling out. Next, let the whole be
thatched with straw, one load of which will be sufficient
for forty tons of roots; and these will be effectually pre-
served for many months, uninjured by frost or snow.

† Kent's "Hints to Gentlemen of landed Property," p. 121.
SITUATION OF A DAIRY.

CHAP. VIII.

OF THE ECONOMY AND MANAGEMENT OF THE DAIRY.

SECTION I.

Situation and Buildings proper for a Dairy.

A dairy ought, if possible, so to be arranged, that its lattices may never front the south, south-west, or south-east; and these lattices, which are in every respect superior to glazed lights, may be covered with oiled paper, pasted on pack-thread stretched for that purpose, so as to admit the light, while they will effectually exclude the sun and wind.

As the greatest cleanliness is requisite in the various departments of the dairy, it will be proper to have separate apartments for the reception and scalding of milk; for keeping and cleaning the vessels, as the steam of hot water greatly injures milk; for making and preserving cheese and butter. These apartments ought to communicate together; but as their peculiar form and arrangement can only be determined by attention to local circumstances, or the convenience of the builder, our limits forbid a discussion of this subject. We therefore proceed to observe, that all dairies should be neatly paved with stone, or, if this cannot be procured, with red bricks, laid upon a gentle descent, lest any water should stagnate. It will likewise be proper daily to wash the pavement during summer; and, as dairy-houses cannot be kept too cool, it would be of great advantage to build them, if possible,
near a cold spring or rivulet. Farther, if a small current could be conducted through the premises, or water were, by means of a pipe, so introduced as to fall from some height on the pavement, it will be of great advantage, as it will contribute much to preserve the air continually pure, fresh, and cool. All the utensils should be made of wood, and be washed with the greatest care before they are used, in order that every possible degree of acidity may be removed. Or, should any metallic utensils, or glazed earthen vessels, be employed, they ought to be daily scalded, and scowered out with salt and water, and thoroughly dried before any milk is poured into them*.

SECTION II.

Management of Milk and Cream.—Making and Preservation of Butter.

The quality of cows' milk greatly depends on the nature of their food, which likewise materially affects the quantity they will yield; though this last circumstance is, in some measure, regulated by the manner of milking them. It will, therefore, be necessary to be very cautious in chusing milkers; because, if a cow be roughly handled, it is not only painful to her, but will also cause her to withhold her milk, which is often attended with serious consequences; whereas, if it be gently drawn, she will yield that salutary fluid abundantly. As it sometimes happens that cows are ticklish, they should, on such occasions, by no means be harshly or severely treated; and if the udder be hard and

* For most of these hints, as well as the subsequent remarks in this chapter, we are indebted to Dr. Anderson's truly valuable "Essay on the Management of the Dairy," as corrected in the third and fourth volumes of his "Recreations in Agriculture," new series, to which we now refer once for all.
OF MILK, CREAM, AND BUTTER. 475

painful, it ought to be fomented with warm water, and rubbed tenderly, by which simple expedient she will be brought into good temper, and yield her milk with pleasure and freedom.

In this country, it is the general practice to milk cows twice in the course of twenty-four hours, throughout the year; but, in summer, the proper periods are at least three every day, and at intervals as nearly equidistant as possible, viz. in the morning, at noon, and a little before the approach of night. For it is a fact, confirmed by the experience of those who have tried it, that cows, when milked thrice in the day, will yield more milk in point of quantity, and of as good if not better quality, than she will under the common mode of milking only in the morning and evening.

After the milk is drawn from the cow, it should be carefully strained through a linen cloth, or hair sieve, (Dr. Anderson prefers a sieve made of silver wires, on account of its superior wholesomeness), into the cream dishes, which should never exceed three inches in depth, though they may be made so wide as to contain any quantity required, and which ought to be perfectly clean, sweet, and cool. If any ill flavour is apprehended from the cows having eaten turnips, &c. the addition of one-eight part of boiling water to the milk, before it is poured into the dishes, will effectually remove it; and, when filled, the dishes ought to be set upon shelves, or dressers, there to continue till the cream is removed*. This should be

* Mr. Young has recommended the dairy-man to boil two ounces of nitre in one quart of water, and to bottle the mixture; of which, when cold, a large tea-cup full is to be added to ten or twelve quarts of milk as soon as it comes from the cow: the quantity of saltpetre is to be increased as the turnips become stronger. The feeding of cows with the roots alone will, as the Earl of Egremont found, prevent the milk from having a bad taste.
steadily done by means of a skimming-dish, if possible, without spilling any upon the floor, because it will speedily taint the air of the room, and the cream poured into a vessel, till enough be obtained for churning.

With regard to the process of making butter, we would observe, from Dr. Anderson's valuable essay, already referred to, 1. The milk first drawn from a cow is always thinner, and inferior in quality to that afterwards obtained; and this richness increases progressively, to the very last drop that can be drawn from the udder. 2. The portion of cream rising first to the surface, is richer in point of quality, and greater in quantity, than that which rises in the second equal space of time, and so of the rest; the cream continually decreasing, and growing worse than the preceding. 3. Thick milk produces a smaller proportion of cream than that which is thinner, though the cream of the former is of a richer quality. If thick milk, therefore, be diluted with water, it will afford more cream than it would have yielded in its pure state, though its quality will at the same time be inferior. 4. Milk carried about in pails, or other vessels, agitated and partly cooled before it be poured into the milk-pans, never throws up such good and plentiful cream as if it had been put into proper vessels immediately after it came from the cow.

From these fundamental facts, the doctor observes, many very important corollaries, serving to direct the practice, may be deduced, among which we can only notice the following:

I. It is evidently of much importance, that the cows should be always milked as near the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes; and as cows are much hurt by far driving, it must be a great advantage in a dairy farm to have the principal grassfields as near the dairy or homestead as possible. In this point of view, also, the practice
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of feeding cows in the house, rather than turning them out to pasture in the field, must appear to be obviously beneficial.

II. The practice of putting the milk of all the cows of a large dairy into one vessel, as it is milked, there to remain till the whole milking be finished, before any part is put into the milk-pans, seems to be highly injudicious, not only on account of the loss sustained by the agitation and cooling; but also, and more especially, because it prevents the owner of the dairy from distinguishing the good from the bad cow's milk, so as to enlighten his judgment respecting the profit that he may derive from each. Without this precaution, he may have the whole of his dairy produce greatly debased by the milk of one bad cow, for years together, without being able to discover it. A better practice, therefore, would be, to have the milk drawn from each cow separately, put into the creaming-pans as soon as milked, without being ever mixed with any other; and if these pans were all made of such a size as to be able to contain the whole of one cow's milk, each in a separate pan, so that the careful *dai* would thus be able to remark, without any trouble, the quantity of milk afforded by each cow every day, as well as the peculiar qualities of the cow's milk. And if the same cow's milk were always to be placed on the same part of the shelf, having the cow's name written beneath, there never could be the smallest difficulty in ascertaining which of the cows it would be the owner's interest to dispose of, and which he ought to keep and breed from.

III. If it be intended to make butter of a very fine quality, it will be advisable, not only to reject entirely the milk of all those cows which yield cream of a bad quality, but also, in every case, to keep the milk that is first drawn

* A provincial word, denoting the person who has the chief concern in a dairy.
from the cow, at each milking, entirely separate from that which is got last; as it is obvious, if this be not done, the quality of the butter must be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the quantity of the last-drawn milk which is used, as it increases in richness to the very last drop that can be drawn from the udder at that time; so that those who wish to be singularly nice, keep for their best butter a **very small** proportion only of the last-drawn milk.

It is a matter of some importance, to determine in what way the inferior milk, which is thus set apart when **fine** butter is wanted, can be employed with the greatest profit. In the Highlands of Scotland, the people have adopted a practice, merely from considerations of convenience and economy, without thinking of the improvement of the butter, which answers many good purposes. As the rearing of calves is there a principal object with the farmer, every cow is allowed to suckle her calf with a portion of her milk, the remainder only being employed for the purposes of the dairy. To give the calf the proportion allotted to it regularly, it is separated from the cow, and put into a small inclosure made for the express purpose, on every farm, of confining all the calves belonging to that farm. At regular times the cows are brought to the door of this inclosure, where the young ones fail not to meet them. Each calf is then separately let out, and runs directly to its mother, where it is allowed to suck till the dairy-maid judges that it has had enough; it is then separated, the legs of the mother having been previously shackled, by a very simple contrivance, to oblige her to stand still, and the dairy-maid milks off what was left by the calf. They proceed in this manner till the whole of the cows are milked, and thus do they obtain a small quantity of milk, it is true, but that of an exceedingly rich
quality; which, in the hands of such as know how to manage it, is manufactured into the richest marrowey butter that can be any where met with. This richness of the Highland butter has been long remarked, and has been universally ascribed to the old grass that the cows feed upon in those remote glens; but it is in fact chiefly to be attributed to the practice here described, which has long prevailed in those districts.

Other secondary uses might be found for the milk of inferior quality. It might be converted into butter of a secondary quality; or might be sold sweet, where the situation of the farm is within reach of a town; or it might be converted into cheeses, which, by being made of sweet milk, if made with care and skill, might be of a fine quality.

With respect to the operation of churning* we would particularly remark, that it ought to be regularly continued, till the butter is come, or formed; nor, unless from absolute and irremediable necessity, should any assistant be allowed to churn; because, if the motion be, in summer, too quick, the butter will in consequence ferment and become ill tasted; and, in winter, it will go back. The business of churning may, however, be much facilitated, by immersing the pump-churn (if such be employed) about one foot deep into a vessel of cold water, and continuing it there till the butter is made. Where other churns are made use of, the addition of one or two tablespoons full of distilled vinegar, after the cream has been considerably agitated, will, it is said, produce butter in the course of an hour. After the butter is formed, the usual practice is to wash it in several waters, till all the milk is removed; but Dr. A. advises the milk to be forced out of the cavities of the butter by means of a flat, wooden ladle,

* For descriptions and figures of useful churns, see the chapters on that subject.
furnished with a short handle, at the same time agitating the butter as little as possible, lest it become tough and gluey. The beating of butter up by the hand is an inde-

licate practice, particularly if it be constitutionally warm; and, as it is hurtful to the quality of the butter to pour cold water on it during this operation, the butter, if too soft to receive the impression of the mould, may be put into small vessels, and these be permitted to float in a trough of cold water beneath the table, without wetting the butter, which will soon become sufficiently firm. Or, when butter is first made, after as much of the milk has been got out as possible, it may be thinly spread on a marble slab, and the remaining moisture be absorbed by patting it with clean dry towels.

Butter thus freed from the remaining milk, is deno-

minated fresh butter: to preserve it sweet, it becomes neces-

sary to be salted, which is usually done in vessels pre-

pared for the purpose, and with common salt. But Dr. 

Anderson recommends the following preparation, which he has experienced to be much superior, as it not only prevents the butter from becoming in any degree tainted or rancid, but also improves its look or appearance, while (what is of more importance) it imparts a sweeter and richer taste than could have been effected by the use of common salt only. Let two parts of the best common salt, sugar and saltpetre of each one part, be completely blended together by beating, and add one ounce of this mixture to every pound of butter, incorporate it thoroughly in the mass, and close it up for use. It will be necessary, however, to keep butter, thus prepared, for two or three weeks before it is used, otherwise it will not taste well; but, if properly cured according to the hints above given, Dr. A. states, that it will continue so perfectly sweet for three years, as not to be distinguished from newly-made and salted butter.
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In different counties there are several variations in the making of this primary article of domestic consumption; but as the hints and cautions already stated are, we trust, sufficiently calculated for general purposes, we conceive it would unnecessarily swell this work to state them; we therefore pass to

SECTION III.

Of the Making and Preservation of Cheese.

The goodness of cheese, as well as of butter, depends much on the quality of the milk; though the season, and particular process adopted in making it, also have a very considerable influence upon it in this respect—more perhaps than the material of which it is prepared. We shall, therefore, briefly notice these circumstances; and, as different modes of making cheese are practised in different counties or places, we shall then concisely state those which are more particularly deserving of notice.

The best season for this purpose is, according to Mr. Donaldson, from the commencement of May till the close of September; or, under favourable circumstances, till the middle of October; during which interval cows are, or can, in general be, pastured. In many large dairies, indeed, cheese is often manufactured all the year round, but the winter cheeses are much inferior in quality to those made during the summer months; though there is no doubt but that good cheese may be made throughout the year, provided the cows be well fed, particularly in the winter.

With regard to the rennet, as no good cheese can be made without it, great attention is necessary in preparing it for coagulating the milk. Strictly speaking, rennet is the coagulated, lacteous matter, or substance, found in the stomachs or maws of calves that have been fed only with
milk; though it is, in a more extensive sense, applied to the *bait, bell, maw,* or *stomach,* as it is variously termed, which possesses the same properties.

Dairy women usually preserve the maw, and the curd contained in it, after salting them; and then, by steeping this bag and curd, make a rennet, to turn their milk for making cheese. But a more simple method, and which is equally good in every respect, is to throw away the curd, and, after steeping it in pickle, stretch out the maw upon a slender bow inserted into it, which will soon be very dry, and keep well for a long time. Take an inch or two of the maw thus dried, and steep it over night in a few spoonsful of warm water; which water serves full as well as if the curd had been preserved, for turning the milk. It is said, that one inch will serve for the milk of five cows.

An ingenious writer, who has made strict enquiry into this subject, recommends the following method of preparing a rennet, which he has found to be better than any other.—"Throw away the natural curd, which is apt to taint and give the bag a bad smell; then make an artificial curd, or rather butter, of new cream, of sufficient quantity to fill the bag. Add three new-laid eggs well beaten, one nutmeg grated fine, or any other good spice; mix them well together, with three tea-cups full of fine salt; fill the rennet-bag with this substance, tie up the mouth, lay it under a strong brine for three days, turning it over daily. Then hang it up in a cool and dry place for six weeks, and it will be fit for use. When it is used, take with a spoon out of the bag a sufficient quantity of this artificial butyrous curd for the cheese you purpose to make, dissolve it in a small quantity of warm water, and then use it in the same manner as other rennet is, mixed with the milk for its coagulation."

But, whatever kind of rennet the dairy-woman may
chuse to prepare, it should be remembered, that this animal acid is extremely apt to become rancid and putrescent, and that great care is necessary to apply a sufficient quantity of salt to preserve it in its best state; because the rank and putrid taste, occasionally found in some of our English cheeses, is owing to a putridity in the rennet. The following mode of preserving it in a sweet state, as practised in the west of England, may not be undeserving of attention. When the rennet-bag is fit for the purpose, let a strong solution of salt be made with two quarts of sweet soft water, and add to this small quantities of almost every indigenous and foreign aromatics and spices that can be obtained. Boil the whole gently, till the decoction is reduced to three pints, over a clear fire, if possible, or at all events, so that it may not become smoky; next let the liquor be carefully strained, and poured, in a tepid state, upon the rennet-bag. A lemon may now be sliced into it; and, after the whole has stood at rest for one or two days, it may be strained and bottled. If well corked, it will retain its goodness for a year, or even longer, and will communicate an agreeably aromatic flavour to the cheese that may be made with it. In a case of emergency, or where no good rennet can be procured, a decoction of the yellow flowers of the cheese-rennet, or yellow lady's bedstraw (Galium verum, L. which blossoms in July and August), will answer every purpose for coagulating milk. Or, the marine acid, in the hands of a judicious person, may be employed for this purpose, as practised in Holland.

Cheshire cheese. The evening's milk is set apart till the following morning, when the cream is skimmed off, and poured into a brass pan heated with boiling water, in order to warm: one-third part of that milk is thus heated. The new milk, obtained early in the morning, and that of the preceding night being thus prepared, are poured into a
large tub, together with the cream. To this is put a piece of rennet, which had been kept in warm water since the preceding evening, and with which a little Spanish arnotto (the weight of a guinea and a half is enough for a cheese of sixty pounds) is rubbed fine and mixed. The whole is now stirred together, and covered up warm for about half an hour, or till it becomes curdled; it is then turned over with a bowl, to separate the whey from the curd, and shortly after broken very small. After standing a little time the whey is taken from it, and the curd sinks to the bottom where the whey is expressed from it; as soon as the curd becomes a little more solid, it is cut into slices and turned over repeatedly, to express all the remaining whey, and is again pressed with weights. Next, the curd is removed from the tub, broken by hand into small pieces, in which state it is termed *gurth* in North Britain, and put into a cheese vat, where it is strongly pressed both by hand and with weights, in order to extract the remaining whey. After this it is transferred to another vat, or into the same, if it be previously well scalded, where the same process of breaking and expressing is repeated, till all the whey is squeezed from it. The cheese is now turned into a third vat, previously warmed, with a cloth beneath it, and a tin hoop or binder put round the upper edge of the cheese, and within the sides of the vat, the former being previously inclosed in a *clean* cloth, and its edges placed within the vat. These various processes occupy about six hours, from seven o'clock in the morning till one in the afternoon. Eight hours more are requisite for pressing the cheese, which, during that time, should be twice turned in the vat, around which are passed thin wire skewers, and frequently shifted. The following morning and evening it must be again turned and pressed; and also on the third day, about the middle of which it is removed to the salting chamber, where the outside is well rubbed with salt, and a
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cloth binder passed round it. Here the cheese is for nearly a week, turned about twice in the day, then left to dry for two or three days, during which period it is turned once, and cleaned each day. Lastly, it is deposited in the cheese or store-room, (which ought to be moderately warm, and sheltered from the access of air, lest the cheese should crack, and turned every day, till it become sufficiently hard and firm. The Dutch make their cheese nearly in the same manner, excepting that they substitute the marine acid, or spirit of sea-salt, which imparts to Dutch cheese the peculiarly sharp and salt flavour for which it has long been remarked,

_Dunlop cheese_ is made partly in the parish of Dunlop, and in places in its vicinity, in the county of Ayr, of various sizes, from twenty to sixty pounds.—After the milk is brought to a certain degree of heat, (about 100 degrees of the thermometer upon an average, though in summer ninety will be sufficient, as, on the contrary, during winter, a higher degree will be requisite), it is poured into a large vessel, where the rennet is added to it, and which is closely covered up for a short time, perhaps ten or twelve minutes. If the rennet be good, it will have effected a coagulation of the milk, which is gently stirred, when the whey begins immediately to separate, which is taken off as it gathers, until the curd become tolerably solid. It is then put into a _drainer_ (a vessel made for the purpose, the bottom of which is perforated with small holes), and the cover of which is pressed down with any convenient weight. After it has thus stood for some time, and is pretty dry, it is returned into the first vessel or dish, where it is cut into very small pieces by means of a cheese-knife, (which is furnished with three or four blades, fixed on prongs from the handle, that cut in a horizontal direction), it is then salted, and properly mixed by the hand. Lastly, it is put into a _cheesitt_, or stout dish with iron
hoops, which has a cover that goes exactly into it; a cloth being placed between the curd and the vessel. In this state it is submitted to the action of the cheese-press, whence it is occasionally taken and wrapped in dry cloths, till it has completely parted with the whey. When this is suspected to be the case, the cheese is laid aside for one or two days, when it is again examined; and, if there be any appearance of whey remaining, the pressure and application of cloths are repeated. As soon as it is ascertained that the whey is extracted, the cheese is laid out, either on boards made for the purpose, (and which are or should be of the same breadth as the cheese), or on a deal floor, as opportunity or convenience may require; care being taken to turn them often, and to clean the floor or boards, as well as to notice whether any whey runs from them, because no cheese will keep well while any whey remains. Besides, if that part sours, the whole cheese will acquire a disagreeable flavour and smell; or, if an immoderate quantity of rennet be used, it will produce similar effects, and also blow up the cheese full of small holes; which last effect will also result from suffering the cheese to continue too long on one side. After the cheese is cured, various modes are adopted in polishing them for sale, which are rather injurious than beneficial; nothing farther being requisite, besides turning them, than to rub them occasionally with a coarse cloth, especially after harvest, because at that time they tend to breed mites*.

Gloucester cheese. In making this sort of cheese, the milk is poured into the proper vessel, immediately after it has been drawn from the cow; but being thought too hot in the summer, it is lowered to the due degree of heat by the addition of skimmed milk; or, if that will not do, by pouring in water. When the curd is come, it is broken with a double cheese-knife, and also with the hand,

* Farm. Mag. vol. iv. p. 381.
to separate it from the whey, which is laded off. The curd is then put into vats, which are submitted to the action of the press for ten minutes or a quarter of an hour, till the remaining whey is extracted. It is next removed into the cheese-tubs, again broken small, and scalded with a pailful of water, lowered with whey in the proportion of three parts of water to one of whey, and the whole is briskly stirred. After standing a few minutes for the curd to settle, the liquor is strained off, and the curd collected into a vat, and, when the latter is about half full, a little salt is sprinkled over and worked into the cheese. The vat is now filled up, and the whole mass of cheese turned twice or thrice in it, the edges being pared, and the middle rounded up at each turning. Lastly, the cheese is put into a cloth, and, after undergoing another pressure, it is carried to the shelves, where it is turned, in general, once a day, till it become sufficiently close and firm to admit of its being washed.

**Stilton cheese** is made by putting the night’s cream to the milk of the following morning with the rennet; and as soon as the curd is come, it is taken out whole and put into a sieve, gradually to drain. While it is thus draining, it is pressed till it become dry and firm, and is then removed into a wooden box, or hoop, adapted to its size; this sort of cheese being so very rich, that it would separate or fall to pieces were not this precaution adopted. Afterwards it is turned every day on dry boards, cloth binders being tied round it, and which are made tighter as occasion may require. After it is removed from the box or hoop, the cheese is closely bound with cloths, which are changed daily, till it become sufficiently compact to support itself; when these cloths are taken away, each cheese is rubbed over every day once (and if the weather be moist or damp, twice), for two or three months, with a
brush, which is also done every day to the tops and bottoms of the cheeses before the cloths are removed.

Skim cheese is chiefly made in the county of Suffolk, by the name of which it is sometimes distinguished. The curd is broken in the whey, which is poured off as soon as the former has subsided; the remaining whey, together with the curd, being thrown into a coarse strainer, and exposed for cooling, is then pressed as closely as possible. It is then put into a vat, and pressed for a few minutes, to extract the remaining whey. The curd being thus drained from the whey, is taken out, again broken as finely as possible, salted, and submitted to the press. The other operations do not materially vary from those adopted in other cheese-making districts. The Suffolk cheese forms, in general, part of every ship's stores, because it resists the effects of warm climates better than others; but it is, Dr. Anderson observes, remarkable for "a horny hardness and indigestible quality."

In making Wiltshire cheese (which is admitted to be among the best English sorts) the milk is "run" as it is brought from the cow; or, if it be of too warm a temperature, it is lowered by the addition of a little skimmed milk. The curd is, in the first place, broken with the hand to various degrees of fineness, according to the sort of cheese intended to be made. Thus, for thin cheese, it is not reduced so fine as in the county of Gloucester; for the thick kind, it is broken still finer; and for loaves it is almost crushed to atoms. But, in first breaking the curd, care is taken to let the whey run off gradually, lest it should carry away with it the "fat" of the cowl. As the whey rises it is poured off, and the curd pressed down; after this it is pared, or cut down, three or four times, in slices, about one inch thick, that all the whey may be extracted, and is then scalded in the same manner as
Gloucester cheese. In some dairies it is the practice, after
the whey is separated, to rebreak the curd and salt it in the
"cowl;" but, in others, it is taken, while warm, out of
the liquor and salted in the vat. The thin sorts are dis-
posed, with a small handful of salt, in one layer; thick
cheeses, with two handfuls of salt, in two layers; and
loaves, with the same quantity, in three or four layers; the
salt being spread, and uniformly rubbed among the curd.
In general, Wiltshire cheese is twice salted in the press be-
neath which it continues, according to its thickness; the
thin sorts three or four "meals," thicker ones four or five,
and loaves five or six.

These are the kinds of English cheese in most general
use and esteem; the other sorts, together with foreign
cheeses, being too numerous to admit of a detail in our al-
ready protracted work. We shall, therefore, conclude
with observing, that cheese should be kept in an airy place,
and that, if the moderately-dried leaves of the tutsan, or
park leaves, as it is provincially termed, (Hypericum An-
drosæum, L.); or, of the yellow star of Bethlehem, (Or-
nithogalum luteum, L.); or, if the young twigs of the
common birch-tree be placed on the surface or sides of
cheeses, they will, especially the tender branches of the
birch, be found very serviceable in preventing the depre-
dations of mites. Sometimes, however, it happens that
cheese will hove or swell, either from some accident, or
from inattention in some part of the process. To prevent,
as likewise to stop, this hoving, it has been recommended
to lay such cheeses in a moderately cool, dry place, and
regularly to turn them. Whenever any one becomes
considerably swollen, it will be requisite to prick it on both
sides in several places, particularly where it is most ele-
vated, by thrusting a large awl, pin, &c. pretty deeply
into it; repeating this as often as may be necessary. And
though the pricking, it is observed, will not altogether prevent the swelling, yet it will, by giving a passage to the confined air, render it less considerable; and the cavities of the cheese will neither be so disagreeable, nor consequently so unsightly or unpleasant to the eye.
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