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THE AMERICAN FARMER'S INSTRUCTOR,

OR

PRACTICAL AGRICULTURIST;

COMPREHENDING

THE CULTIVATION OF PLANTS,
THE HUSBANDRY OF THE DOMESTIC ANIMALS,
AND THE ECONOMY OF THE FARM;

TOGETHER WITH

A VARIETY OF INFORMATION WHICH WILL BE FOUND IMPORTANT TO THE FARMER.

BY FRANCIS S. WIGGINS,
LATE EDITOR OF THE FARMERS' CABINET, MECHANICS' REGISTER, &C. &C.

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Errata.—Page 52, last line, for "not usually" read "*naturally,*" in part of the edition.
Pages 199 and 200, for "desiccation" read "*defecation.*"

INTRODUCTION.

This work is offered to the public with entire confidence in its merit, and in the importance of such a publication to the American farmer. The necessity which calls for it is manifest from the avidity with which information is sought on the subject from various sources, and which has originated agricultural societies, periodical publications, &c., all of which answer a very excellent purpose in stirring up the spirit of improvement.

But all these sources, while they have furnished means for, have not answered the design of this work. This is intended to be a standard—a complete text-book; embracing, in as condensed a form as possible, all that is most valuable in relation to the science of agriculture. It is designed to be a practical instructor, whereby the farmer may make himself acquainted with the principles and operations of his business.

Its advantages will be apparent, from the consideration that it will teach the *nature* of soils,—*properties* of manures for enriching them,—their *adaptation* to the various *grains, grasses, plants*, &c.—the influences of successive crops,—best method of cultivation; and the rearing and feeding of all kinds of animals, as the horse, ass, mule, ox, cow, sheep, hog, &c. And by a copious index appended, reference may be had, as occasion requires, to any particular subject on which information is wanted. This will save the labour of turning over volumes of periodical publications.

The author was well qualified for the task of furnishing such a work to the community. He was, until the time of his decease, well known as the Editor of the Farmers' Cabinet, Mechanics' Register, &c. &c. He closely applied himself for a long time to the preparation of this work, carefully investigating facts in order to ascertain principles, and with the sincere desire of promoting the agricultural interests. This alone would entitle his productions to the patronage of the farmer.

But he had only just completed his arduous labours, when in the providence of God he was removed from earth to the land where the weary are at rest. He has left behind an amiable wife and several children, who have an interest in the profits of this publication. This is an additional reason why the American farmer should make this book his own, that he may contribute his share towards the support and comfort of the family of the Farmer's friend, who devoted his time and talents for their good.

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PRINCIPLES

OF

PRACTICAL AGRICULTURE.

I.—SOILS.*

I. REMARKS ON THE DIFFERENT CLASSES AND CHARACTER OF SOILS.

By analyzing the substance which constitutes the coat or outer covering of the earth, denominated soil, it is found to consist of a combination or mixture of several distinct and separate descriptions of matter which chemists have denominated *primitive earths*, forming a stratum or layer, varying from a few inches to several feet in depth. This stratum or soil possesses no uniformity of colour, but is naturally somewhat dark, a circumstance arising from the admixture with it of the decomposed stems, leaves, and other parts of plants which have sprung up upon it, and in part often by the presence of animal substances, together with certain saline and mineral ingredients. It is this outer coat or covering of the earth in which plants are produced.

It is this mixture of animal and vegetable substances with the mineral matter of the upper stratum, which distinguishes it from the mass of earth or rock lying *beneath* it, to which the term SUB-SOIL is applied. The decomposed animal and vegetable portion of the soil may be termed *mould;* and it is the presence of mould accordingly which distinguishes the soil from the sub-soil.*

Soils may be distinguished according to their texture and

* In this and the following section, we have, in part, adopted the arrangement and some of the opinions of PROFESSOR LOW, the fundamental principles of the science being the same in every country.

† Low on Agriculture.

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constitution, when they may be divided, for all necessary purposes, into two classes—the stiff or strong, denominated clays: the light or free, subdivided into the sandy, gravelly and peaty: and all three again may be distinguished, 1. according to their power of production, when they are termed rich or poor; and 2. according to their habitual relation with respect to moisture, when they are termed wet or dry. The fertility will also, in a great measure, depend upon the relative proportion of the primitive earths, as they must be in combination to ensure a good soil.

Soils that abound with, or partake of clay, marl, mud, or sand, which are high or low, dry or humid, strong or light, of which the staple has more or less depth, are all capable of useful production, but they demand a different cultivation the one from the other, in order to gain the products which each species will, or is able to yield. The tillage, manure, seeds, and the seasons proper for the different operations they require, are among the objects which the cultivator ought to understand.* It is only by experiments made upon the spot itself, and without regarding the ancient methods, too generally followed in every country, that he will be able to discover the truth. In that design he will succeed well, and even beyond his expectation—if he multiplies his essays in every kind of culture, by adopting and following only that which he finds the best from his own experience.

The fertility of soils is indicated by the greater or smaller proportion of mould which enters into their composition. When soils are thus naturally fertile, or are rendered permanently so by art, they are frequently termed *loams:* thus, there are clayey loams and sandy loams; and peat itself may, by the application of labour and art, be converted into loam.

The parts of plants which grow upon the surface, and are mixed with the mineral matter of the soil, may decompose and become *mould.* Under certain circumstances, however, the plants which have grown upon the surface do not decompose, but undergo a peculiar change, which fits them to resist decomposition. They are converted into peat, and the soils formed of this substance are termed *peaty.* The peaty soils are distinguished from all others by their great diversity, as well as by their peculiar characters.

Sub-soils are distinguished from soils, properly so termed, by the absence of mould. Plants when growing may extend their roots into the sub-soil, and decomposing there be mixed with it. But this is in small quantity, and for the most part

* Arthur Young, Esq.

the sub-soil is readily distinguishable by the eye from the upper stratum or soil, by the absence of animal or vegetable matter in a decomposed or decomposing state.

Sub-soils may either consist of loose earthy matter, like the soil, or they may consist of rock sub-soils, therefore may be divided into two classes, the *rocky* and the *earthy*. The rocky consists of granite, sandstone, limestone, chalk, and the other mountain rocks of a country. When readily penetrated by water falling on the soil, they are termed free or porous; but when they resist the entrance of water they are called close or retentive.

The earthy sub-soils may, in like manner, be divided into the close or retentive, and the free or porous. The retentive are those which, from containing a large proportion of clay, are tenacious and cohesive in their parts; that is, tending to unite in a mass and resist separation. They also resist in a great measure the entrance or passage of fluids. The porous are those which, having less of clay in their composition, are more readily penetrated by water, by which means all superfluous moisture may be absorbed.

On the nature of the under stratum depends much of the value of the surface soil, says Mr. Loudon, and on various accounts its properties merit peculiar attention. He says, that by examining the sub-soil, information may be obtained in regard to the soil itself; for, although the substances in the soil are by various mixtures in the course of cultivation necessarily altered, the materials of the soil are in most cases identified with or similar to those which enter largely into the composition of the sub-soil. "Disorders in the roots of plants are generally owing to a wet or noxious sub-soil."

There are only four kinds of simple primitive earths, which enter into the composition of soil.* These are *clay*, *sand*, *lime* and *magnesia*. These, variously combined, and in different proportions, so far as earth is concerned, constitute all the vast varieties of soil, such as wet, dry, warm, cold, light, heavy, barren or fruitful.

The *clayey soils* have, as their distinguishing character, the adhesiveness of their parts; and this property alone will enable even the inexperienced to recognise them without difficulty. Clay, known as *aluminous* or *argillaceous* earth, as an ingredient of soil, has the four following properties by which it exerts a powerful effect upon vegetation. *First*, it greatly absorbs and retains moisture. *Secondly*, when thoroughly

* There are also other earths known in chemistry, but not in agriculture, as they are found only in certain substances, in small quantities, and do not form the constituent properties or parts of any soil.

soaked and afterwards dried, it hardens and cakes into a solid mass, and if quickly brought from a wet to a dry condition it approaches the state of bricks previous to their being burned. *Thirdly*, when exposed to heat it shrinks and looses considerable in bulk. *Fourthly*, it powerfully retards putrefaction by enclosing, as in a case, animal and vegetable remains, by shutting out the dissolvent action of the external air.

Clay soils are tilled with difficulty when too dry, and when too wet this operation has the same effect as the tempering of clay has in the art of making bricks. The tillage of such lands in a proper state, is therefore of the greatest importance; and this is best performed when they are neither too wet nor too dry. They require to fertilize them, a larger proportion of manures than the freer soils; but they retain the effects of the manures for a much longer time. They are better suited to the cultivation of plants with fibrous than with fleshy roots or tubers. Hence it is that wheat, beans, oats, clover, cabbage, grass, &c., do well on clayey soils.

Clays, like the other soils, approach to their most perfect condition as they advance to that state which is termed *loam*. The effect of judicious tillage and of the application of manures, is to improve the texture of such soils as well as to enrich them. Thus, clays in the neighbourhood of cities become dark in their colour and less cohesive in their texture, from the mixture of animal and vegetable matter, and thence acquire the properties of the most valued soils of their class. The value of a clayey soil depends essentially on its having an open sub-soil, which renders it more tractable and productive.*

Clayey soils need only to be properly managed to become the most perfectly fertile and productive of any. It is recommended to mix with the soil such substances, mineral and vegetable, as will separate, loosen and mellow it; and to loosen the sub-soil either by the use of the sub-stratum plough,† or otherwise, to a sufficient depth to let the surplus water readily pass *below* the roots of the plants. The proper substances for this purpose are vegetable matter, as straw, rushes, even small bushes, saw-dust, animal manures, sand, anthracite coal ashes, and where the soil does not contain lime, that may be most advantageously applied. Clay, until its very adhesive properties are corrected, is an unpleasant soil to cultivate, especially for hoed crops; and for those which are cultivated solely with the plough, more skill, as well as more labour is requisite for preparing the ground for the proper reception of the seed.

Where earths have been rendered as dry as they can be by

* Sir John Sinclair's Code of Agriculture.
† See chapter on Agricultural Implements.

exposure to the air, they still retain a considerable quantity of moisture or water, the clayey earths containing, when apparently dry, one fourth of their weight, while the lighter kinds hold only from a tenth to a twentieth part of the fluid, according as the sand predominates. It would seem that this circumstance gives to clayey soils the advantage which they possess over those which are light and sandy. But clays may nevertheless be too solid and compact to admit of the extension of the roots of plants in search of food, and in such case the evil is to be corrected by the application of sand, or some other substance, coal ashes, for instance, calculated to destroy this undue quality of adhesion.*

Sand or gravel, sometimes called *silex*, *silicious* matter, or earth of *flints*, is distinguished by properties of a totally opposite character. 1. It is incapable of retaining water when poured on it, and far more of attracting moisture from the atmosphere. 2. It powerfully promotes putrefaction, but it suffers the gases set at liberty to escape, and the soluble fluid matter to descend. 3. There is little or no cohesion among its several parts.

This class of soils belongs to that denominated the light or free. They are readily distinguished from the stiff or clayey by their smaller degree of tenacity. They are less suited for the production of wheat and beans than the clays, but they are well adapted for the production of plants cultivated for their roots and tubers, as the turnip and potato. This class of soils may be divided into two kinds, or sub-classes, differing from each other in certain characters, but agreeing in the common property of being less tenacious in their parts than the clays.

The sandy soils partake of all the degrees, from barrenness to fertility. When wholly without cohesion in their parts, they are altogether barren, and are only rendered productive by the admixture of other substances, such as marl, clay, shells, peat, vegetable earth, &c. It frequently happens that under the sand itself, or in the immediate neighbourhood, the very materials may be found so essential to its improvement. This is the case in parts of New Jersey, Delaware, the Eastern Shore of Maryland, and in many other localities, especially along the southern seaboard.

Sandy soils, being easily cultivated, are valuable, unless of the poorest class. And in this case they may, by a proper and judicious course of treatment, be made to possess a greater cohesiveness in their particles. They may therefore be fertile by nature, or rendered so by art; and then they become of

* Nicholson's Farmer's Assistant.

deserved estimation—being denominated *rich sands*. They are cultivated at a moderate expense; and at all seasons have a dry soundness, accompanied by moisture, which generally secures excellent crops, even in the driest summers.

Rich sands are early in maturing the cultivated plants—and thence they are familiarly termed *kindly soils*. They are fit for the production of every variety of herbage and grain. They yield to the richer clays in the power of producing wheat, but they surpass them in the production of rye and barley. They are well suited to the growth of the cultivated grasses; but their distinguishing character is their peculiar fitness for the raising of the plants cultivated for their roots and tubers.

Gravels, like sand, have all the gradations of quality, from fertility to barrenness. The latter are, in general, termed *hungry soils*, from their tendency to absorb manure without any apparent corresponding benefit to the land; but as their staple becomes firmer by the admixture of other earth, so do their properties improve. The richer kinds produce every species of grain, except beans and wheat, which may be grown on them however, but not to decided advantage. They are not only admirably adapted to the growth of barley and oats, but may be generally regarded as trusty soils, with regard to the quality of the grain which they yield; and being quick in their powers of producing vegetation, they are in some places termed *sharp* or *quick* soils.

Lime, commonly called *calcareous earth*, though one of the primitive earths, is never found naturally in a pure state, forming an arable surface. It is nevertheless present, perhaps, in all good soils; is widely diffused, and performs an important function in the vegetable economy. In nature, this mineral is usually found in combination with acids. Combined with carbonic acid, it constitutes the numerous varieties of marble, limestone and chalk. In this and other combinations, it exists in rocks, in soils, in the waters of the ocean, in plants, and in animals.

It is chiefly from the carbonate that the lime used in agriculture is obtained. If a piece of limestone or chalk, pulverized, be placed in strong vinegar, or sulphuric acid (oil of vitriol), diluted with water, there will be an effervescence. This is owing to the carbonic acid being set at liberty, which rising throws up bubbles in rapid succession, and escapes in the form of gas. The carbonic acid is also driven off by exposing the carbonate to a strong heat; and that which remains is the caustic earth to which we give the name of quick-lime. The burning of limestone is for this purpose.

Limestone, in burning, loses about half its weight; but the quick-lime thus produced, possesses a strong affinity for water, which it will absorb from the atmosphere. When water is applied in quantity, it is absorbed by the lime, with a great evolution of heat, and this is the process of slacking so well known. The lime thus combined with water attracts carbonic acid, and again becomes carbonate of lime. It differs from its original state in its external characters only, and in the lesser degree of cohesion of its parts, for otherwise the substances are the same.

As an ingredient of the soil, lime is closer than sand, but much less adhesive than clay. It occupies therefore a middle region, as it were, between the two, free from their imperfections, and blending their common qualities. It is also a necessary ingredient in the organization of plants, many of which cannot reach their full vigour and luxuriance without it. Wheat in particular requires its presence, and where it does not already exist in the soil, it ought to be supplied, at whatever expense, for the production of superior crops.

Magnesia earth, like lime, is usually found in combination with carbonic acid—but even in this, its natural state, it exists in such very small quantities in soils, and is found so rarely, and the functions it performs in the economy of vegetation so doubtful, that its name is an almost useless addition to the list of the earths of agriculture.

All the earths, individually, when as pure as they are ever furnished by nature, are entirely barren, nor would any addition of putrescent manures, enable either of the earths to support healthy vegetable life. The mixture of the three earths, first enumerated, in due proportion, will correct the defects of all, and with a sufficiency of animal or vegetable matter, a soil is formed. Such is the natural surface of almost all the habitable world; and though the qualities and value of soils are as various as the proportions of their ingredients, yet they are mostly so constituted that no earthy ingredient is so abundant but that the texture of the soil is mechanically suited to the production of some valuable crop. There is no mode of improving the fertility of a soil, so permanently efficacious, as that of adding to the land a proportion of the earthy ingredient of which it is naturally deficient.

Some plants require a degree of closeness, and others of openness, in the soil, which would cause other plants to decline or perish. As the qualities and value of soils depend on the *proportion* of their ingredients, and the grand point in agriculture being to obtain a mixture of the earths best calculated to produce the greatest variety of the most valuable crops, we are enabled to comprehend in what manner that object may be obtained.

Silicious (sandy) and aluminous (clayey) earths, by their texture, as before observed, serve to cure the defects of each other. The open, loose, thirsty, and hot nature of sand, being corrected by, and correcting in turn the close, adhesive and wet properties of aluminous earth. This curative operation is merely mechanical; it seems probable that calcareous earth, when in large proportion, also aids the corrective power of other earth. But earth is not the only substance contained in soils.*

Much is said of the *analysis* of soil, by which is understood its decomposition, or the separating of its parts so as to exhibit the different ingredients it contains and the proportions of each. By the *basis* of any soil, we understand the primitive earths which enter into its composition. See Appendix A.

A substance that exists largely diffused in the mineral kingdom, is oxide, or rather peroxide of iron. It is found extensively in mountain rocks, and it exists accordingly, in more or less quantity, in almost every soil. Its precise effects, however, on the productive power of soils, have not been well determined; some soils, where it exists, being extremely barren, while in some very fertile soils it exists in large quantity. Soils which contain much of iron may be termed FERRUGINOUS.

It is therefore all important that the farmer should acquire sufficient knowledge to comprehend and understand the nature and properties of his soil, and the various substances of which it is composed—in all or on all of which he is daily engaged. His subsequent efforts to improve the soil, will no longer be submitted to guess work, but will be regulated by a correct or proper knowledge of the materials he may have to work with—how each may be best applied or acted upon with the greatest advantage, and what effects will ensue from their different combinations. There is no need for the farmer to be a profound chemist, though he would be a gainer by it. He should certainly understand enough to enable him to distinguish the character of the great variety of soils, and the proportions of their various combinations.

Lord DUNDONALD, in a treatise published many years since, says that the cultivator "should understand the properties and effects, and superior affinities of alkalies and acids—as well as the names, properties, and compounded electrive attractions attendant on the mixture of the different neutral salts, and their effects on vegetation. They should be well acquainted with

* See an interesting paper on this subject by JOSEPH CLOUD, Esq., in Farmers' Cabinet.

the powers of lime and other mineral agents, and distinctly comprehend the putrefactive and oxygenating processes, as well as the consequences resulting from the action of fire on the vegetable fibre or matter contained in the soil."

A judicious farmer, when he fixes upon a spot for cultivation, will endeavour to ascertain the relative proportion or combinations of the various earths constituting the soil he is to till—in what proportions they severally abound, and the nature and extent of the vegetable matter existing in the soil. Possessing this information, he will be enabled to administer to each part of his farm those particular substances necessary to render it a rich and fertile mould.

"When we regard the distribution of plants in different regions, we perceive that this is determined by causes which have little relation to the nature of the soil on which the plants grow. The soils of all countries are, in their essential characters, alike. The same mineral masses, composed of the same substances, exist over all the world, and yield, by their disintegration or decomposition the same materials for forming soils.

"Yet, although the mineral matter of the soils of all countries is thus similar in its constituent parts, it is altogether different with the vegetation by which these soils are characterized. Every zone, from the equator to the polar circle, is distinguished by a different vegetation, and different regions have their peculiar natural plants.

"Among the natural causes which effect the vegetation of countries, the influence of *Temperature* is that which is the most obvious to the senses. When we pass from a warm country to a cold, we perceive a change in the whole character of the vegetation. We cannot ascend a mountain without finding such a change in the character of the plants produced, and in the vigour with which they grow, dependent upon the change of atmosphere."

The degree of *Moisture*, too, the distance or proximity of the sea, and other circumstances connected with the climate and physical condition of the country, affect the nature of its vegetable productions, and show, that the influence of soil, with respect to the kinds of plants produced, is entirely subordinate to that of temperature, and the effects of climate. Water constitutes a large portion of all plants—without which they either become stunted in their growth, or perish—yet water alone, without the addition of other substances, will not sustain them, much less bring them to perfection.

It is generally known, that soils possess the power of *absorbing moisture* (or water) in different degrees. This power depends more upon the *geine* of soils than any other principle. *Alumina* stands next on the list in its degree of absorbing power—next, *carbonate of lime;* and least of all, *silicia.** Hence there ought to be a general correspondence between the absorbing power of a soil and its fertility; and, therefore, this property affords some assistance in estimating the value of a soil.

When we extend, then, the range of our observation to different or distant countries, we see that the nature of the plants cannot indicate that of the soils on which they grow. It is only within narrow limits, and under given conditions of climate, that the kinds of plants afford any certain indication of the nature of the soils which produce them.

In distinguishing soils, a difficulty frequently occurs in discriminating the *peaty* from the *earthy*. Peaty soils generally lie on a retentive sub-soil; but perhaps the best method of distinguishing them in the absence of their peculiar vegetation, is by the stones which lie upon their surface. These appear to be acted upon by the acid matter of the peat, which, when once observed, will not be easily mistaken again. Coupling this indication with the dull black, as distinguished from the brighter hazel of the loam, and above all, with the peculiar vegetation and sterile aspect of the surface, an observer will soon learn to distinguish the peaty soils from the earthy.

In examining the earthy soils, an essential circumstance to be regarded is, the *depth* of the soil, and the *texture* of the sub-soil. A medium depth of a soil, may be held to be from ten to twelve inches. But it will be better that it exceed a foot, and this greater depth of the soil is always a favourable indication. If the depth of the soil does not exceed six inches, it may be considered as an unfavourable indication. But the staple of such soils, by careful, persevering and judicious management, may be greatly improved, and brought to such a state as to rank with those of the most fertile class of soils; but this, in a great measure, depends upon the character of the sub-soil.

Shallow soils are rarely good, except sometimes when they occur resting on peculiar rocks, as compact limestone, and certain easily decomposed basalts. If a shallow soil shall occur on a retentive clay, or on silicious sand, we may certainly pronounce it to be bad. When in the common operations of tillage the plough is constantly turning up a sub-soil very different in colour from the upper stratum, that is an unfavourable indication.

When we find the rain in a furrow of ordinary descent carrying off the soil, and leaving the sub-soil exposed, that is an

* See Hitchcock's Economical Geology of Massachusetts. It is replete with interesting facts.

unfavourable indication. It is desirable to see the water in the furrows sink down and be absorbed, instead of carrying off the surface soil. If the soil be of a dull black colour, and if it present upon its surface the white stones just referred to, that is an unfavourable indication, as it shows that the soil has more or less of peat in its composition.

If the soil produces sub-aquatic plants, it is wet. If we find that such a soil is peaty, or shallow on a retentive sub-soil, it is naturally sterile. If we find that the sub-aquatic plants are tall and vigorous, and the soil earthy and deep, the removal of the wetness may remove the cause of infertility, and such a soil may become of the richest kind.

If we find a soil producing naturally the superior herbage plants, and of a good depth, that soil we may infer to be good. When soil of this kind tends to a dark hazel colour, we may safely rank it among the superior soils.

II. MEANS OF INCREASING THE PRODUCTIVE POWER OF SOILS.

The means at our command for increasing the productive powers of soils may be comprehended under the following general heads: 1. Supplying to the soil those organic and earthy substances which may be required. [The grand desideratum in many, if not most, infertile soils is calcareous matter, that is, carbonate of lime. The second desideratum is an additional quantity of geine, that is, a larger supply of the food of plants.] 2. Altering its depth, texture, and properties by tillage and other means. 3. Changing its relation with respect to moisture. 4. Changing its relation with respect to temperature.

Vegetable and animal matters, in a decomposing state, appear to act in various ways in increasing the productive powers of the soil. They improve its texture, and they may be supposed to increase its power to absorb and retain moisture; but above all, they supply that matter, which, in whatever form conveyed to the organs of plants, tends to nourish them. This matter being absorbed by the roots of the plants, it must be supplied when exhausted.

Experience has in every age accordingly taught the husbandman to supply those substances to the soil; and the doing so forms one of the most important means at his command of maintaining or increasing its fertility.

Besides the animal and vegetable matter which is mixed or combined with the mineral part of the soil, and is essential to its productiveness, the mineral parts themselves require to be mixed together in certain proportions, and in certain states of division, in order to produce the greatest degree of fertility.

Silica (sand) and alumina (clay) form the principal mineral parts of the soil. If one or other of these earths be in excess, the soil is defective in its composition. If the alumina prevail, the soil is too adhesive—if the silica prevail, it is too loose; a medium is therefore best: and although the precise proportions in which these two earths should exist have not been determined, it is safer that there should be a tendency to an excess of clay than of sand. Further, the fertility of the soil depends on the state of mechanical division of these minerals; that is, the more thoroughly the parts are separated or pulverized, the greater will be the increased fertility of the soil.

Sometimes therefore we have the means of improving the constitution of soils, by mixing sand with clay, or clay with sand. But in practice, the very extensive mixing of these two substances is rare, because the state in which sand and clay are usually available for this purpose, it seldom happens that the matter of both is in that state of minute division which is favourable to fertility.

It is otherwise with the earth Lime. This can, in all cases, be reduced by heat to that state of minute division which is favourable to the productiveness of soils; and hence it can always be supplied with benefit to those soils in which its presence is required.

The composition of soils may be improved, as we have shown, by the addition of animal and vegetable matter; and also, in many cases, by the addition of those earths in which they may be deficient; and in an especial degree of lime, which we can always employ in the form of minute division, best suited to improve the composition of the soil. This is the first of the means referred to of adding to the productive powers of soils.

The *second* mode referred to of increasing the productive powers of soils, is that of altering their texture, depth and properties, by tillage and other means. The mere effect of that separation of the parts of the soil which it undergoes in the common operations of tillage, is seen to have a very beneficial influence on its productive powers. Whether it imbibes from the atmosphere any thing besides aqueous vapour or not, it is known that the exposure of the matter of the soil to the atmosphere, and the separation or pulverization of its parts by tillage, add permanently to its fertility.

The first object of pulverization is to give scope to the roots of vegetables, for without an abundance of roots or fibres no plant can become vigorous, whatever may be the richness of the soil in which it may be placed. The more the soil is pulverized, the more numerous are the absorbing fibres of the roots, the more extract is consequently absorbed, and the more vigorous does the plant become. Pulverization therefore is not only advantageous previously to planting or sowing, but also during the process of vegetation, when applied in the intervals between the plants.

We thus learn from experience the good effects of *tilling lands well.* Soils once tilled are rendered for the most part more productive by the process. Peaty turf, if suffered to remain in its original state, may continue to produce nothing but the most useless plants; but if merely ploughed and exposed to the influence of the atmosphere, it will at once tend to produce grass of a better kind and of greater variety.

Another purpose sometimes promoted by tillage, and subservient to the amendment of the soil, is the deepening of the upper stratum. The sub-soil, as has been already shown, is distinguished from the soil, properly so called, by the former containing less vegetable and animal matter, and so being less suited to the nourishment of plants; and in certain cases it is even found to be injurious to vegetation. But as a good depth of soil is necessary, (unless under rare and peculiar circumstances,) it is often expedient, in order to effect a permanent improvement of the surface, to plough up and mix with it a portion of the sub-soil, even though that sub-soil should be in itself infertile.

Another means possessed by us of adding to the productiveness of soils, by changing their composition, is by incineration, commonly called *paring* and *burning*. These are the principal mechanical means by which we can improve the soil.

The *third* mode referred to of increasing the productive powers of soils, is changing their relation with respect to moisture. The water of the soil where superabundant may be withdrawn, and when deficient supplied. The first method is termed *draining*, and the latter *irrigation*, both of which form a peculiar branch of agricultural improvement, and will be treated of in this work.

The *last* of the means referred to of increasing the productive powers of soils, is by changing their relation with respect to *temperature*. This mode is less within our control than any of the others. It is only by slow degrees that we can improve the climate of a country. It is chiefly by draining and by the rearing of hedges and wood; and all of these accordingly form important objects of rural economy.*

* Low's Practice of Agriculture.

II.—MANURES.

All substances which, when mixed with the matter of the soil tend to fertilize it, or existing in the atmosphere can be drawn in by the organs of plants, and thereby contribute to the progress of vegetation, are in common language termed *Manures.* Manures may be composed of animal or vegetable substances—or they may consist of mineral matter—or, they may be derived partly from mineral and partly from animal and vegetable substances. They may therefore be classed, according to their origin, into—1. Animal and vegetable manures. 2. Mineral manures. 3. Mixed manures.

A manure may also be defined to be "the addition to land of any fertilizing principle, or ingredient, in which the soil is naturally deficient." The three earths, lime, alumina, (clay,) and silex, (flint,) constitute, as we have already remarked, the principal ingredients in all cultivated soils—the richest soils are those in which these three earths are mixed in the most fertile proportions—the excess of either renders the soil barren. The farmer must not suppose, however, that what is commonly called clay is exclusively alumina, for such is not the fact, as some stiff soils denominated clayey, have, on a careful analysis, been found to contain from twenty-eight to sixty-three per cent. of that material. The fact is mentioned in this place in order that farmers may be on their guard.

I. ANIMAL AND VEGETABLE MANURES.

On examining the constituents of vegetables, we shall find that they are composed of oxygen, [formerly called vital air,] carbon, [coaly matter,] hydrogen, [inflammable air,] and nitrogen, or azote, which is one of the constituent parts of the atmosphere. It is evident, therefore, that the substances employed as manure should also be composed of these elements, for, unless they are, there will be a deficiency in some of the principles of the vegetable itself—and it is probable that such deficiency may prevent the formation of those substances within it for which its peculiar organization is contrived, and upon which its healthy existence depends.

But there are likewise found in plants, though in comparatively minute quantity, certain other bodies, consisting chiefly of the four earths, silica, alumina, lime, and magnesia, of the oxide of iron, and, in small quantity, the oxide of manganese, and of the alkalies soda and potassa, but chiefly the latter. Now all these bodies, or the elements of these bodies, exist in animal and vegetable manures; for these being animal and vegetable substances, are resolved into carbon, hydrogen, oxygen and nitrogen, with the intermixed earthy and other bodies existing in the living plants.

In supplying, therefore, animal and vegetable substances to the soil in a decomposing state, we, in truth, supply the same substances which enter into the composition of the living plants. These substances indeed exist in the dead matter of the manures, in states of combination different from those in which they exist in the living vegetable. But still they are present, and no doubt supply the nutritive matter which the plants require in growing.

Science has made known to us the truth, that the living plant and the dead manure are resolvable into the same elementary substances; but experience has not the less taught the husbandman in every age, that all animal and vegetable substances, mixed with the matter of the soil, tend to fertilize it by affording nourishment to the plants which it produced.

Vegetable and animal substances deposited in the soil, as is shown by universal experience, are consumed during the process of vegetation, and they can only nourish the plant by affording solid matters capable of being dissolved by water; or gaseous substances capable of being absorbed by the fluids in the leaves of vegetables; but such parts of them as are rendered gaseous, and pass into the atmosphere, must produce comparatively small effect, for gases soon become diffused through the mass of the surrounding air.

The great object, therefore, in the application of manure, should be to make it afford as much soluble matter as possible to the roots of the plant, and that in a slow and gradual manner, so that it may be entirely consumed in forming its sap and organized parts. Water is apparently the medium by which all the matter of nutrition, in whatever form, is conveyed into the roots of plants, and without which, accordingly, vegetation is never known to take place. Therefore it is, that the substances which form animal and vegetable manures, before they can be made available as nutriment to plants, must be rendered soluble in water.

Till within a few years past, the state in which vegetable or animal matter exists in the soil, and the changes through which it passes before being taken up by the roots of the plant, were almost entirely unknown to chemists. Long ago, however, KLAPROTH had discovered a peculiar substance in the elm tree, which he denominated *ulmin*. More recently it was found by BRACONNOT in starch, saw-dust, and sugar—and by the distinguished Swedish chemist, BERZELIUS, in all kinds of barks. SPRENGEL, and POLYDORE BOULLAY, have ascertained, also, that it constitutes a leading principle in manures and soils. Hence they called it *Humin* (or, as is generally written, *Humus*); but BERZELIUS adopts the name of *Geine*. When wet, it is a gelatinous mass, which, on drying, becomes of a deep brown, or almost black colour, without taste or smell, and insoluble in water; and therefore, in this state, incapable of being absorbed by the roots of plants. Yet, after the action of alkalies upon it, it assumes the character of an acid, and unites with ammonia, potassa, lime, alumina, &c., and forms a class of bodies called *Geates*, most of which are soluble in water, and therefore capable of being taken up by plants. And it is in this state of geates, that this substance for the most part exists in the soil.—*Economical Geograph. of Massachusetts, by Edward Hitchcock, Esq.*

The statements of BERZELIUS, though highly interesting in a theoretical point of view, afford very little light, and consequently but little information to the practical agriculturist. Those of Dr. SAMUEL J. DANA appear far more important, in a scientific as well as a practical view of the subject, notwithstanding they essentially coincide with those European chemists as far as they have gone.* "This method of analysis, derived from his researches, I must say, after having made extensive application of it to our soils, is simple and elegant—and, taken in connexion with his preliminary remarks—it appears to me to be a most important contribution to agricultural chemistry, and promises much for the advancement of practical agriculture."†

By *Geine*, says Dr. Dana, I mean all the decomposed organic matter of the soil. It results chiefly from vegetable decomposition—animal substances produce a similar compound containing azote. Geine exists in two states—soluble and insoluble: soluble both in water and in alkali—in alchohol and acids. Soluble geine is the food of plants. Insoluble geine becomes food by air and moisture. Hence the reason and result of tillage. Hence the reason of employing pearl ash to separate soluble and insoluble geine in analysis. These are the facts. Will they not [ultimately] lead us to a rational account of the use of lime, clay, ashes and spent ley? Will they not account for the superiority of unfermented over fermented dung in some cases?

Geine forms the basis of all the nourishing part of all vegetable manures. The relations of soils to heat and moisture depend chiefly on geine. It is in fact, under its three states of "*vegetable extract*, *geine* and *carbonaceous mould*," the principle which gives fertility to soils, long after the action of common manures has ceased. In these three states it is essentially the same. The experiments of SAUSSURE have long ago proved that air and moisture convert insoluble into soluble geine. Of all the problems to be solved in agricultural chemistry, none is of such great practical importance as the determination of the quantity of soluble or insoluble geine in soils. This is a question of much higher importance than the nature and proportions of the earthy constituents, and soluble salts of soils. It lies at the foundation of all successful cultivation. Its importance has been not so much overlooked as undervalued.

Among the few facts best established in chemical agriculture, are these: That a soil, whose earthy part is composed wholly, or chiefly, of one earth; or any soil with excess of salts, is always barren; and that plants grow equally well on all soils, destitute of geine, up to the period of fructification—

* It is but justice to say, that Dr. Dana derived his knowledge of geine chiefly from his own researches, made with a view to improve the colouring process in the calico printing establishment at Lowell—and his method of analyzing soils is altogether original.—*Hitchcock's Geology*. † *Ibid.*, page 30.

failing of geine, the fruit fails, the plants die. Earths, and soils, and geine, constitute, then, all that is essential—and soils will be fertile, in proportion as the last is mixed with the first. The earths are plates, the salts the seasoning, the geine the food of plants. The salts can be varied but very little in their proportions without injury. The earths admit of wide variety in their nature and proportions.* The doctrines of BERZELIUS and others, have encountered an opponent—no less zealous than intelligent—in M. F. V. RASPAIL, a celebrated French chemist, who, in his System of Organic Chemistry, now translated into English, denies the existence of any such proximate principle in soils as geine.

Of the means which nature employs for this purpose, *fermentation* appears to be the chief. The elementary parts of the substances fermented, assume new forms of combination, and become fitted to supply the matter of nutrition to plants in that form in which it can be received by the pores of the roots. The process of fermentation is completed after the substance to be used as a manure is mixed with the matter of the soil. It is common also to cause it to undergo a certain degree of fermentation *before* it is mixed with the earth. This is the method of preparing this class of manures for use, which is employed in the practice of the farm.

Animal matters decompose with facility when acted upon by moisture and the air, the greater proportion of their elementary parts making their escape in various forms of gaseous combination, leaving the earths, alkalies, and part of the carbonaceous matter remaining. But when this decomposition takes place beneath the surface of the ground, these gaseous compounds, as well as the carbon, which, when it combines with oxygen, assumes also the gaseous state, is partially or wholly retained in the earth, to afford the matter of nutrition to the plants.

Therefore no putrefactive process ought to be suffered to proceed on a farmer's premises, without his adopting some mode to save, as far as possible, the gaseous products of such putrescence. These gaseous products, as has been observed, constitute important elements of vegetable food, and a farmer may as well suffer his cattle to stray away from his stall, or his swine from their sty, without a possibility of reclaiming them, as permit the principles of fertility expelled by fermentation or putrefaction to escape into the atmosphere for the purpose of poisoning the air, instead of feeding the plants.

It is very easy to arrest these particles, and thereby prevent

* DR. DANA'S Letter to PROFESSOR HITCHCOCK.

the escape of the gaseous matter into the atmosphere; as a quantity of earth thrown over the matter in which the fermentation is going on, will check its violence and arrest its gaseous products, which will be imbibed by the soil, and afterwards yielded to plants in such proportion as the wants of vegetation may require.

Fermentation, that destroyer of all organic conformation, is not to be feared by the farmer, if it be carried on in the presence of earth, which fixes and secures the gases as fast as they are liberated. In the composite-hill [compost-heap] the whole animal or vegetable structure may be dissolved, and leave behind no trace of existence, without the least waste of the principles of fertility.

We may go farther and state that complete decomposition is desirable in this case, which is so much to be avoided in the farm-yard; because putrescent matter can only become vegetable food by its resolution into primary parts, and if this be effected by any preparatory step, the young crop receives the full and immediate benefit. The compost manure is carried to the field ready to give out its richness on the very first call, and to supply the nascent radicle [young root] with a copious share of nourishment.

The putrefactive process may be carried on in the presence of pure earth only, or of earth intermingled with fibrous roots, or lastly in the presence of peat, which is an assemblage of inert vegetable matter, and compost dung-hills may be formed according to this threefold method.

The *simplest of all composts* is a mixture of barn-yard dung and surface-mould taken from a field under regular culture. The proportions between the ingredients are fixed by no determinate laws, and consequently great liberty is allowed to the operator. Some use two cart loads of dung to one of earth, others blend them in equal quantities, and it is not unfrequent to compound them two of earth and one of dung. Such is the uncertainty in the composition, that almost every farmer adopts a method peculiar to himself, and with equal success.

The only error into which the farmer can run is to supply such an inconsiderable quantity of soil as will be incapable of imbibing the elastic and volatile particles, and thus by his own mismanagement occasion a waste of the vegetable aliment. One cart load of soil to two of stable dung, is the least proportion which he should ever attempt to combine, and perhaps, if the two were mixed in equal proportions, he would be compensated for the additional labour and expense.

Simple earth, although excellent for bottoming and strewing over the pit dung near the barn, is of all materials the most unprofitable in compost hills. A matted sward, thickly entangled with roots, or mud, dragged from the bottom of bogs or ditches, and replete with aquatic plants, are clearly preferable on this account, that besides bringing earth to the composition, they supply a large proportion of vegetable matter.

Whenever the soil must be carted to the heap, it is better to lay out the expense in transporting enriching materials, because they will not only equally absorb and retain the evaporating gases, but greatly augment the quality of manure.*

Pure animal matter, by undergoing fermentation, and being mixed with vegetable matter, promotes the more speedy decomposition of the vegetable fibre, which, under certain circumstances, is a slowly decomposing substance. When vegetables are green and full of juices, they readily ferment; but when the stems are dried, as in the case of straw and other litter, they decompose slowly, and the mixing them with animal matter hastens the putrefactive fermentation. This mixing of animal with vegetable matter is the process employed for preparing the greater part of the dung of the farm-yard.

Farm-yard manure must ever be ranked in the first class, and when improved yards have been constructed for the soiling of cattle, and attention has been paid to the quality as well as the increase of their dung, the manure thus produced becomes of inestimable value. No husbandman can carry on his business, successfully, without it. The manure heap has not been unaptly described as the farmer's gold mine.

Every farmer who attends for a moment to the difficulty of obtaining a sufficient quantity of dung, as well as of preparing what is got, will acknowledge that however imperfectly the subject be understood, none is deserving of more serious consideration; yet even the most superficial observer on the common state of culture can hardly fail to remark, that the evident inattention to its management is such as would almost lead to the conclusion, that it was not worth the pains of the farmer's care.

It is not uncommon—indeed nothing is more common—in certain parts of our country, to see large heaps of manure thrown out from the stables and feeding sheds, and exposed in that state to the weather, without any regard to its being laid up in a regular or careful manner, secured from evaporation, or carefully mixed in different proportions, according to its various qualities; yet these proportions are each of a very distinct and important nature.

The dung of the farm-yard is a collection of animal and

* Letters on Agriculture, by John Young, Esq.

vegetable substances. It consists of the excrements of the animals kept and fed upon the farm, together with the straw or other materials used as litter, and generally of the refuse and offal produced about the homestead.

This mixed mass is collected during the process of feeding, when it undergoes a certain degree of fermentation. When trodden down by the feet of the animals kept in the yards, the effect is to exclude the external air, and to prevent the fermentative process from that rapidity which would take place were the mass not compressed. The principal animal substances which are mixed with the lignous [woody] fibre of the litter, and which cause it to undergo decomposition, are the dung and urine of the animals.

The properties of this dung, to a certain extent, depends upon the kind of animals and the nature of their food. The dung of *horses* is easily fermented, and is more readily decomposable, in proportion to the succulent and nutritive qualities of the food consumed. The dung of *oxen* or horned cattle also soon ferments when it is collected into a heap, and is only moistened by its own humidity; but this process is slower than in the dung of horses, because it is not so much exposed to the same internal heat, in consequence of which its evaporation is less; and being voided in a very moist state, it does not require to be wetted.

Sheep dung decomposes quickly when it is moist and compactly heaped together; but when dry and dispersed, its decomposition is slow and imperfect. Its effect upon the soil is soon dissipated, and is generally exhausted after a second crop. It is rendered more particularly valuable upon soils which contain insoluble mould, from the ammonia [*volatile alkali*] which is disengaged from the excrements, and more especially from the urine of sheep.

When animals are fed on straw and the dried stems and leaves of plants, the dung is less rich and decomposable than when they are fed on roots and other nourishing food; and the same thing holds with respect to the dung of the *hog* and other animals. The dung of the different feeding animals is mixed in greater or less proportion with their litter; and the greater the proportion of the animal to the vegetable matter, the more readily will the latter ferment and decompose.

The *urine* of animals is in itself a very rich manure, and contains, in certain states of combination, all the elements which enter into the composition of plants. It is necessarily mixed with, and partly absorbed by, the litter and other substances in the yards, and it hastens in a material degree the fermentation of these substances. The urine, however, is apt to make its escape by flowing out of the yards or being imperfectly mingled with the litter.

It becomes, therefore, a part of the management of the farm-yard, to provide against either of these contingencies. The farm-yard should be level at bottom, and even paved, if the sub-soil be very loose and sandy. Some persons, after removing the surface to a suitable depth, cover the whole with a thick layer of tenacious clay. The bottom should be sunk somewhat below the surface of the ground, deepening gradually to the centre. A great diversity of opinion as to their proper structure prevails. A very intelligent writer in the Farmers' Cabinet, I. C***D, Esq., of Delaware county, says:

There is no branch of agriculture so much entitled to the consideration of the farmer as that of the accumulation and preparation of the food of vegetables. All are aware that the principal source of vegetation is that of putrescent matter; consequently, their attention is naturally directed to the collection of as much vegetable and animal substances as possible. Barn-yards are appropriate recipients for such accumulation. South exposures are the most desirable locations. The direct influence of the sun greatly promotes decomposition. The bottoms of barn-yards should be level, and so enclosed that the extracts from the manure produced by rains, should be retained as much as possible. The bottom of the yard should have a covering of loose earth, of some inches, which is designed as an absorbent to retain the extractive matter, and to be removed in common with the other manures when employed for agricultural purposes. The covering of earth should always be renewed previous to the commencement of the re-accumulation of putrescent matter.

When the stock of cattle and horses are to be finally removed from the barn-yard for the summer, the surface of the putrescent manure should be covered with a mixture of earth and hydrate of calcium. The effect of this covering is of much importance, as it serves to retain moisture, and to promote decomposition. The hydrate of calcium being soluble, a portion may be dissolved, and descend into the putrescent matter; there, meeting with carbonic acid, it becomes a carbonate, and consequently insoluble. The hydrate of calcium remaining on the surface, will absorb the carbonic acid formed by the putrefaction of the matter underneath. It will also obtain a considerable quantity from the atmosphere, thereby treasuring up a large amount of the food of vegetables, to be used at the discretion of the farmer, that would otherwise have been lost. Previous to removing the manure from the barn-yard, it should be well mixed, forming an excellent compost for any purpose that may be desired.

As a portion of the liquid will flow from the stables and feeding-houses, gutters of stone should be made to conduct it into reservoirs in or adjacent to the yard: and similar means should be adopted for conveying from the yard any excess of liquid; not for the purpose of draining the yard of moisture, which would be exceedingly wrong, but with a view of preventing an excess of liquid from being lost; as the principal cause which produces a great flow of liquid from the yard, is an excess of rain, which falling upon the heap faster than it can be absorbed, washes away the urine.

The substances thus collected and partially fermented, is to be applied to the ground during the months of spring, summer, or autumn, immediately following the winter in which it has been prepared. It should always be applied as soon after it has been prepared as possible, their being a waste either in retaining it too long, or in causing it to undergo a greater degree of fermentation than is required.

Certain kinds of plants require a greater action of manures at particular stages of their growth than others. Thus the beet, turnip and carrot, require that the manure applied shall be in such a state of decomposition as to act upon and nourish them in the first stages of their growth—otherwise the crop is very liable to fail. In these and similar cases accordingly, the complete preparation of the farm-yard dung is an essential point of practice.

Other plants, again, do not require the same state of decomposition of the dung. The potato requires less in the first stages of its growth than the turnip, and hence it is unnecessary to subject the manure to be applied to the same degree of fermentation.

But while no necessity exists for fermenting the matter of the barn-yard beyond the degree requisite for the special purpose intended; yet, it is always a point of good practice to ferment it to that degree. In order to know when it is sufficiently fermented for the particular use required, a very little practice and observation will suffice for the intelligent farmer.

When fully fermented, the long stems of straws which formerly matted it together, are in such a state of decomposition, that the parts can be readily separated by a fork. Whenever farm-yard dung has been fermented to that extreme state of decay in which we often see it used by gardeners, in which it can be cut by a spade like soft earth, it has been kept beyond the proper time, and the management has been *bad.*

In some cases the manure is mixed with the soil some time before the seeds of the plants to be cultivated are sown. In this case the manure undergoes the necessary fermentation in the soil itself, and does not require that previous preparation which, in the case of the turnip and some other plants, is indispensable.

When the mass of vegetable and animal substances is thrown into a common yard, care should be taken to spread it evenly or equally, so that one part may not be filled with rich and another with poor dung. The dung of horses more quickly ferments than that of oxen; therefore horse-dung should not be allowed to accumulate in a mass, but spread abroad upon the general heap.

Farm-yard dung is generally applied to the soil when in a state of tillage, by being spread upon the land and covered with the plough. Being thus covered by the earth, it readily passes through its course of fermentation, becomes decomposed, and is mixed with the matter of the soil.

This valuable substance must be economized in the manner of applying it. The soil must be kept as rich as the means at the farmer's command will justify; but it is a grand error in practice to saturate it at one time with manures, and to withhold them at another. They ought to be applied in limited quantity and frequently, so as to maintain a uniform or increasing fertility in the soil.

The produce of the farm-yard, will necessarily afford the chief part of the manure consumed upon farms which do not possess extraneous sources of supply. But besides the immediate produce of the farm-yard, there are certain vegetable and animal substances, which, in the separate states, may be applied to the manuring of land.

An example of the application of vegetable substances in this state, is when certain plants are allowed to come into flower, and are then ploughed down in their green state, and mixed with the matter of the soil. This practice, derived from very ancient times, prevails extensively in Europe, and has been beneficially adopted in some sections of our country.

Where *green dressings* are resorted to, as a manure, such growths should be selected for the purpose as are cheap in the article of seed, and at the same time quick, vigorous and bulky. Buckwheat is much used for this purpose; other plants of rapid growth and great yield, would probably answer as good if not a better purpose. Clover, at the suggestion of speculative writers, has been thus employed, whereby an error has been frequently committed of using a valuable article as manure, which might have been employed in the first place in supplying the animals of the farm.

When this practice is adopted, the period at which the plants may be ploughed down is when they have come into flower, for then they contain the largest quantity of readily soluble matter, and have least exhausted the nutrient substance of the soil. In order that the growth be turned effectually under, it should be laid prostrate by running the roller over it, in the direction in which the plough is to follow.

There are instances in which green dressings are advisable, particularly if they do not prevent the growth of an intervening crop. Where this is not practicable, we should hardly advise to this method of manuring, unless in cases where other manures cannot readily be obtained.

A green dressing may be given with great advantage, for instance, where a crop of rye, oats, or barley has been harvested, and the ground cleared by the twentieth of July. In this case, let the stubble be immediately turned under, and the ground harrowed in with buckwheat, sown thickly. By the twentieth of September this growth would probably be fit to be turned under, when a crop of wheat might be sown on the lay.

Weeds, in general, are likewise of great service, if they be cut down in their most succulent state, shortly before they flower; as they are then not only most disposed to putrescence, but also the injury which would otherwise result from the perfection of their seeds will thus be effectually avoided.

Hence weeds ought not, as is too frequently the practice, to be heedlessly burnt or thrown into the highway; but if they be laid in heaps, in their juicy state, and occasionally turned over and covered with soil, they will certainly perish, and speedily become putrid.

The *leaves of trees* also form a vegetable manure, though not a very good one; for although leaves enrich, to a certain degree, the surface upon which they fall and decay, they will rarely repay the expenses of collecting them expressly for manuring land. But where they can be readily collected in quantity, they make an excellent addition to the vegetable matter of the barn-yard and the pig-sty.

The other principal vegetable substances employed as manure in their separate state are the following:

The *ashes of wood and all vegetables* may be used as a manure. They have a marked and very beneficial effect when applied as a *top dressing*, especially to grass lands; they also answer a most valuable purpose when applied to Indian corn, particularly when the soil is not suitable to that plant.

In all new countries, such is the fertility of the soil, and the abundance of native salts and vegetable matter furnished through a long course of growth and decay, that the first series of cultivators find little use for the manures, and the expedients for meliorating the soil, which are so necessary in the older cultivated countries. Hence, materials which are considered invaluable for these purposes in the states on our seaboard, from Maine to Louisiana, and in Europe, and other countries, are, in our new settlements, considered as a nuisance, and wasted in immense quantities.*

One of the most prominent articles used in manure along the seaboard, and sought after with an avidity that shows its real value in meliorating the soil, is *leached ashes*, a substance which appears to have received no attention from the farmers of the interior, except it was to devise some easy method of disposing of the quantities so rapidly accumulating around their leach-tubs and asheries. Millions of bushels—we might almost say loads—of this valuable material are annually wasted.

There is scarcely a process in farming, or an article used for substantially improving the soil, for which more decisive testimony can be found, than may be adduced in favour of ashes as a manure.

Under the head of *stimulating manures*, CHAPTAL, in his justly celebrated work on agriculture, makes these remarks:

* From forty-five to seventy years back, the great difficulty with many farmers, residing in this state east of the Susquehanna, was how to get rid of their stable manure. Many who had fixed barns, carted the manure early in spring to the nearest creek to be carried off by the succeeding freshet, while thousands of stacks were suffered to waste. The descendants of these farmers now know the value and importance of that which their forefathers discarded.

"The ashes produced by the combustion of wood in our common domestic fires, give rise to some very remarkable results. Without being leached, these ashes are much too active; but after having been deprived, by the action of water, of nearly all their salts, and employed in this state, under the name of *buck-ashes*, [leached,] they still produce great effect.

The action of the buck-ashes is most powerful upon moist lands and meadows, in which they not only facilitate the growth of useful plants, but if employed constantly for several years, they will free the soil from weeds. By the use of them, land constantly drenched with water may be freed from rushes, and prepared for yielding clover and other plants of good kinds.—*Chaptal.*

It has been frequently supposed that ashes applied to wet heavy soils is injurious. This is probably owing to the application being too uneven, and in too large quantities, and to the want of mixing them intimately with the soil. When applied to *wet* lands the ashes are immediately dissolved, and it may be that the plants cannot take up the active properties with sufficient rapidity, and it therefore, in many instances, passes off in its dissolved state into the sub-soil; but how this should occasion moss and barrenness is beyond our comprehension. The author just quoted says, "Wood-ashes possess the double property of amending a wet and clayey soil by dividing and drying it, and of promoting vegetation by the salts they contain." It is also found to succeed well on dry loamy lands, or loam mixed with sand.

It is well known, that the evenly spread and intimately intermixed layer of ashes which soils receive by burning the turf, produce extraordinary fertilizing effects upon grass lands—effects which are visible for years.

One principal reason why leached ashes is so valuable as a manure, appears to have been mostly overlooked, and that is the quantity of *lime* they contain, which substance is placed in considerable quantities at the bottom of the vats or leaches in all asheries, to facilitate the labour of working, and is thrown out with the ashes.

This fact, taken in connection with the one that a large portion of alkaline matter must remain in all ashes after leaching, accounts for the benefit they render to wet sour soils, by neutralizing such acid, and promoting the decomposition of vegetable matter, which, in such earths, always proceeds slowly, while at the same time they prevent adhesion in the soil, and enable the roots of plants to seek their sustenance freely. On light sandy soils they give consistency, and by the existing action of their still abundant salts effectually promote vegetation.

Peat-ashes, properly burnt, afford an excellent manure for

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both corn and grass lands; but the most valuable are those obtained from the lowest stratum of the material, where the fibres and roots are thickly set and mostly decayed. This yields a large quantity of very strong ashes.

Sea-weed is another vegetable manure that may be used with the greatest profit, where the situation of the farmer gives him access to this material. The best mode of applying sea-weeds is to cut them in their most succulent state, and immediately plough them in.

River or *pond-weeds* are capable of a similar application, and with great benefit, on loose sandy soils intended for beets, turnips, &c.; 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 is twelve or fourteen cart loads to the acre.

Rape or *cole-seed cake*, reduced to a coarse powder, (in extracting the rape-seed oil,) is used with great success as a manure in England, and on the continent of Europe. It contains a large quantity of mucilage, some albuminous matter, and a small quantity of oil. The manure should be recent, and kept as dry as possible before it is applied. It forms an excellent dressing for turnip crops, and is most economically applied by depositing it in the soil at the same time with the seed. It is highly esteemed as a top dressing for grass lands. It is also employed in England for the feeding and fattening of animals, for which purpose it is very highly esteemed.

Malt-dust, or the refuse which is screened from malt in drying, affords, on account of its saccharine matters, an excellent vegetable manure for grass lands, in the proportion of from forty to sixty bushels to the acre. It is best calculated for cold clays, or stiff loamy soils, but not those inclined to gravel. It should be applied as dry as possible, and all fermentation prevented.

The seeds of the *cotton-plant* have been, recently, in some portions of the southern states, applied to the manuring of land, and found to be among the most fertilizing of this class of substances.

Linseed-cake, though an excellent article, is too valuable as a food for cattle to be much employed as a manure. The *water* in which *flax* and *hemp* are steeped for the purpose of obtaining the pure vegetable fibre, has considerable fertilizing powers. It contains much vegetable extractive matter, and putrefies readily; it should be applied as soon as the vegetable fibre is removed.

Of excrementitious animal matter, applied in its unmixed state, one of the most useful is *night-soil*, a substance which is very liable to decompose; and whether recently or fermented, supplies abundantly the food of plants. In France, Belgium, Holland and England, the attention paid to it as a manure, is very great, and it is employed in different states of fermentation, according to the crops to which it is to be applied.

The disagreeable odour of this substance may be destroyed by mixing it with quick-lime. When it is exposed to the atmosphere, and the layers are strewed over with lime, it soon dries, and is easily pulverized. It then forms one of that valuable class of manures which may be deposited in the ground at the same time with the seed.

A company has been lately organized in the city of New York, for the purpose of collecting, drying, pulverizing and preparing night-soil, according to the most approved method adopted in France and the Netherlands. It is called *Poudrette*, is packed in casks, and may easily be transported to any part of our country. Throughout the vast empire of China, night-soil, made into cakes and dried by exposure to the sun, forms a common article of commerce.

The *dung of birds* is a powerful manure, though usually obtained in quantities too small to render it an object of much importance. The most generally employed is that of pigeons and domestic fowls. It should be spread upon the surface of land in tillage, and slightly covered. It may be reduced also to powder, and applied in different ways.

The *flesh and intestines of animals* are sometimes used as manures. When in contact with the air, these substances undergo a very rapid decomposition, and should therefore be covered by the soil before their particles have been lost by evaporation; or they may be mixed with earthy substances and formed into a compost. This last is generally the preferable practice with regard to them, because they thus act in fertilizing a large quantity of matter with which they are mixed.

The collections of the *slaughter-house*, and the refuse of the *shambles*, furnish the largest supply of this kind of manure, and it is always highly valuable where it can be obtained. When animals die from accident or disease, they should never be left exposed, but be covered with earth, which will be soon impregnated with soluble matters. [See page 29]. The disagreeable effluvia of such substances may be lessened, if not entirely removed, by a mixture of quick-lime.

Fish forms a very powerful manure, in whatever state it is applied; but it cannot be ploughed in too fresh, though the quantity should be limited. It is generally best to mix it with earth in the form of a compost, to prevent raising a too luxuriant crop, as instances have occurred in which herrings spread over a field and ploughed in for wheat, have produced so rank a crop, that it was entirely laid before harvest.

It is easy to explain the operation of fish as a manure. The skin is principally gelatine, which, from its slight state of cohesion, is readily soluble in water; fat oil is always found in fishes, either under the skin or in some of the viscera; and their fibrous matter contains all the essential elements of vegetable substances. Its effects are visible for several years.

Among *oily* substances, *blubber* has been employed very beneficially as a manure. It is most useful when mixed with clay, sand, or any common soil, so as to expose a large surface to the air, the oxygen [vital air] of which produces soluble matter from it. The best way is to form it into a compost, a layer of earth and then of blubber, and so on. It should be well stirred three or four times, at different intervals, and not used under nine or twelve months.

The refuse of various manufactures in which *skin, wool* and other animal substances are used, forms manure of various quality, according to the substances employed and the nature of the manufacture—such are the *refuse of the currier*, the *offal of the glue-maker*, and various others of similar character.

Bones are regarded as a very important animal manure. In the hands of intelligent agriculturists they are a powerful agent in fertilizing the soil. Those which are most usually employed contain nearly equal quantities of phosphate [salt formed by a combination of phosphoric acid, with a base of earth, alkali, or metal,] and gelatine, [an animal substance soluble in water,] of which they are principally composed.

Bones, it is well ascertained, contain, in an abundant form, the food of plants. They are made up of a large amount of animal substance mixed with earthy and saline matter—and they abound in what chemists call the phosphate of lime, a substance, which, as we have before observed, is found in some measure in all plants, and a powerful means and instrument of vegetable growth.*

Bones have been used as a manure for many years in Europe, with the greatest advantage; and they are now sought after, by intelligent farmers in the United States, with the greatest avidity. At first, after being broken down and boiled for grease, they were sold to the farmer; but since their more general extension as a manure, they are applied in their raw state. They form in the old countries a very considerable article of commerce.

* Rev. Henry Colman, Massachusetts.

The bones are ground, or rather they are crushed, and reduced to a coarse powder, by being passed through cylinders of a peculiar construction. Plaster mills are used by some in this country. The most preferable form in which they can be used is in that of a coarse powder. It is, however, the opinion of many, that they are superior as a manure when they have undergone a previous fermentation, which is easily effected by placing them in a mass by themselves, as they will speedily ferment. They may be also formed into composts with earths, and thus allowed to ferment in the heap. We, however, decidedly prefer its application in the form of powder.

They may be applied in several ways to the ground. They may be spread upon it by hand, or by machines constructed for the purpose, or by apparatus attached to certain sowing machines; when deposited at the same time with the seeds, if by the drill, the quantity may be two quarts per acre.

Bones constitute a very efficient and a comparatively cheap manure. Stable manure, in Boston or Philadelphia, costs the farmer in its first purchase, its transportation, and preparation for the land not far from five dollars per cord. His land may be manured with bone manure with equal advantage, and for a third of the expense of stable manure; and its actual improvement to the soil will be more permanent.*

The lightness of carriage, its suitableness for the drill, and its general fertilizing properties, render it peculiarly valuable. The use of bones diminishes labour at a season of the year when time is of the first importance, for one wagon load of drill bone-dust is equal to forty or fifty loads of fold manure.

In England, bone manure is generally applied to the turnip crop, that crop commonly preceding wheat. The effect is very great, causing lands which had been comparatively barren, to produce a crop, and not only pushing the crop several days in advance of that manured with stable manure, but also greatly increasing the product.

They have been used with signal advantage spread upon grass land; the feed being greatly improved, and the return from the stock fed upon it, in milk and butter through the season, very much increased.† The Farmer's Cabinet, vol. iii. p. 17, contains a very interesting communication from Samuel W. Smith, on the superiority of bone manure, over all others, in the culture of the turnip. The experiment is detailed with a good deal of precision. See Appendix B.

Its effects upon the production of wheat in Great Britain have been thus stated, after careful observation, compared with

* Rev. Henry Colman, Massachusetts. † Ibid.

the best stable manure. In respect to the quality of the grain, as seven to five. In respect to the quantity, as five to four. In respect to the durability of its effects on the soil, as three to two. But no account is here made of the difference of the cost of the two applications—the lightness of transportation of the bone manure, and the ease of applying it to the soil.

Bones are less beneficial when applied to clay lands than to lighter soils, and in wet seasons than in dry. Although the quantity of the material employed is very small, it is not quickly exhausted, but extends its influence to future seasons. For the production of a single crop, an increase beyond a certain quantity is not found to be attended with any benefit; so that a small quantity is frequently seen to be applied with equal advantage as a large.

Horn is a substance of similar properties, and equally efficient as a manure; but it is obtained in very limited quantity, and its general importance is therefore greatly inferior to that of bones. Yet, in large cities and towns, it is not unfrequently the case that comb-makers' shavings and offal may be collected in considerable quantities.

Hair and *feathers* are similar in their composition to horn, but, like it, are of little importance, from the limited quantity in which they can be obtained. They are also slowly decomposable; and of that class of manures which may be applied to trees, which require a slow and not a rapid action.

Woollen substances are also of the same chemical composition as those last mentioned. They only become soluble, however, after a considerable time. Nevertheless woollen rags form a good and lasting manure. They are to be cut into small pieces, spread upon the surface of the ground and then covered. They are used in the extensive hop districts of England, for the manuring of that plant.

II. MINERAL MANURES.

According to Professor Low, the mineral substances which are employed as manures may be supposed to exert two modes of action. *First*, they may act upon the soil by improving its texture, or by rendering soluble the parts of it which are insoluble; or by otherwise fitting it to promote the growth of plants. *Secondly*, they may act immediately upon the plant itself, by being received into its substance.

"We cannot generally distinguish when a mineral substance acts upon the plant, through the medium of a change in the soil, or where it acts directly upon the plant itself. All that we truly know is, that certain earthy and alkaline bodies, or their saline combinations, applied to the soil, promote the growth of plants, and so, in the language of farmers, are manures."

Of all the mineral substances known to us, LIME is that which performs the most important part in improving the soil, and promoting the growth of vegetables. It is found in nearly all soils that are capable of sustaining vegetation; and, in combination with different acids, in a vast variety of vegetable substances.

Limestone, from whatever series of rocks derived, when submitted to the action of heat loses the carbonic acid* with which it was united, becomes a substance of an acrid nature, absorbs water with an evolution of heat, and by this union forms what is termed a hydrate. In absorbing water it crumbles down by degrees, while at the same time it begins to imbibe carbonic acid from the atmosphere.

In absorbing carbonic acid, the water of the hydrate is expelled, the carbonic acid taking its place. In this way the lime recovers the principles which it had lost by the action of heat. It becomes again a carbonate, without resuming its former hardness and external characters. In proportion as its recomposition takes place, it loses the properties which it had acquired by calcination, [fire,] ceases to be acrid and caustic, and its solubility in water is diminished.

Lime is applied to the soil either in a state of hydrate, that is, immediately after being slacked, and when it still retains its caustic qualities, or in the state of carbonate, that is, after it has again absorbed carbonic acid from the surrounding atmosphere and become mild.

Caustic lime performs two functions apparently opposed to each other. While it dissolves vegetable fibre and renders it soluble, it possesses also the property of forming *compounds* of a soapy nature, with the soluble portion of vegetable and animal substances, which compounds are not dissolved till after a very considerable time. Lime forms these insoluble compounds with almost all the soft animal or vegetable substances with which it can combine.

It has been ascertained from a series of experiments carefully made in England, by Bishop WATSON, and it is believed they will apply equally well in this country, that upon an average of every ton of 2240 pounds, good limestone produced 1292 pounds of *quick-lime*, weighed before it was cold; and

* *Carbonic acid* is a combination of carbon and oxygen. It was formerly called fixed air, on account of its being so intimately combined in chalk, limestone, magnesia, &c.

that when exposed to the air it increased in weight daily, at the rate of a hundred weight per ton, for the first five or six days after it was drawn from the kiln.

A ton of fresh well burnt lime will absorb 680 pounds, or nearly one-third of its weight of water, without being slacked—and a bushel of good stone-lime, when slacked, will measure two bushels; hence slacked lime should sell at one-half the price per bushel of stone-lime.

Quick-lime applied to succulent vegetables absorbs the moisture from them, and renders them perfectly dry and brittle, and if the quantity of lime be great compared with the vegetable matter, combustion takes place, and the matters acted on are reduced to ashes, but are not decomposed in the usual understanding of the term.

Lime, spread on the surface sod, is in some measure prevented by the grass and the fibres of the roots from descending into the earth, and the rains from time to time dissolve it, and carry down the alkaline solution, so as to completely moisten every particle of the soil with it.

This neutralizes the acidity of the soil, and the carbonic acid gas of the atmosphere converts the solution into carbonate of lime in connection with every particle of earth it comes in contact with, and this being much less adhesive than clay, when it comes to be ploughed, the particles easily separate, and hence the property of lime in rendering the soil less adhesive, and more easily penetrated by the roots of plants in search of food.

Where much vegetable matter abounds in a soil, it will absorb and retain the solution of lime as a sponge, which being converted in its interstices into a carbonate, will tend to impede its too speedy decomposition; as vegetable matter in our climate decomposes with too much rapidity for plants to take up the nutriment it affords as rapidly as it is produced.

By the decomposition, however, being impeded or checked by the carbonate of lime, it proceeds more slowly, and proceeds to give out food for plants more gradually, and for a much longer period of time. This appears to confirm the observations of many of our farmers, that where lime is used the manure or dung continues to produce its effects for an unusual period.*

The application of lime to night-soil does not hasten the decomposition of this substance, [see page 39], but, on the contrary, forms with it a less soluble compound. It moderates its action, and renders its effects less sudden, but more perma-

* This is the opinion of some of our best farmers—and the opinions advanced in the five preceding paragraphs are ably defended by an intelligent writer in the third volume of the Farmers' Cabinet, pages 27, 60, 152.

nent. Mixed, too, with any pure animal substance, lime does not waste it, as reasoning from its action on vegetable fibre, we might infer. It facilitates decomposition, it is true, but then it forms with the substance decomposed, compounds less easily decomposable.

The application of lime calls into powerful action the nutritient principles of the soil—and hence, if land be severely cropped after lime has been used, it is reduced to a greater state of sterility than if the stimulant had not been applied. Lime, therefore, calculated as it is to produce the best effects in fertilizing a soil, is frequently made the means, in the hands of an injudicious farmer, to injure it.

This is especially observable in the case of light soils of an inferior kind. These are frequently so injured, by injudicious cropping after the application of lime, that they are reduced to complete barrenness. When soils are brought to this condition by scourging or exhausting crops, they cannot be restored to fertility by a subsequent application of lime; on the contrary, a future dose almost invariably renders them more barren than before. The only efficient remedy is a generous application of vegetable and animal manures—and rest in grass.

But although the stimulating properties of lime may be abused, it is an instrument of production of the highest importance in the hands of the skilful and intelligent farmer. On land improved and cultivated for the first time, it exercises a very powerful influence, and it is difficult to conceive how, in many parts, such land could be improved at all without the assistance of this mineral.

Whenever it is deemed expedient to deepen a soil by ploughing up and bringing to the surface a portion of the sub-soil, the application of lime is not only the most speedy, but also the most effectual means of correcting the defects, or stimulating the productive powers of the new substance exposed. But in all cases, to admit of the beneficial action of lime, the soil should be *freed of superfluous water*. Not lime only, but all manures, are comparatively inefficient when the land is saturated in consequence of excess of wetness.

A mixture of lime with earthy matter, previous to its being applied to the soil, is considered as a highly beneficial practice. In this case the lime should be used in its unslacked state.

The best earthy materials for mixing with lime, are those which contain a certain proportion of decomposing organic matter; such are the scourings of ditches, the sediment of pools, mud deposited by rivers and tides, marsh-mud, and all similar substances. The lime may be applied at the rate of two bushels to the cubic yard, and fifty cubic yards of this mixture to the acre, will form a rich and efficient manuring for any soil.

Materials for forming manures of this class are abundant and constantly presenting themselves. Old gardens, waste collections of earth, sweepings of roads and the like, scrapings of brooks and ditches, the collections of weeds, leaves, and other vegetable substances under fences and along the headlands of fields, are always to be found in more or less quantity.

A mixture of lime in the proportion mentioned above, will ferment these substances, even when they are not peculiarly abundant in organic matter. The mass will heat, and then it should be turned over once or oftener to render the fermentation perfect, and destroy the seeds of plants which may be mingled with the substances to be fermented.

It is an error—though entertained by many farmers—to suppose that lime, in any state, comprises fertilizing properties within itself; and that, without operating upon the soil, or upon the substances which it contains, it is an enriching manure. It is said not to possess any fertilizing principle in its own composition, being merely a calcareous earth, combined with fixed air, and holding a medium between sand and clay, which in some measure remedies the defects of both.

By the analysis of soils, we find that all productive earth contains a certain portion of lime, and although we learn from experience that its stimulative powers upon the roots of plants are very great, yet we are but very imperfectly acquainted with the extent or the exact manner in which its influence is brought into action, and we are, in a great measure, ignorant of the actual changes that are produced upon the earth after this manure has been applied.

In no state in the union has lime been so extensively and advantageously used for agricultural purposes as in Pennsylvania. It has very justly received the attention of our ablest farmers and men of science. The most satisfactory and succinct statement relative to lime, that has yet fallen under our observation, is the following, by Dr. WILLIAM DARLINGTON, of Westchester, Chester county, Pennsylvania.

Lime undoubtedly has a good effect in soils which are *sandy*, even where sand predominates. But its meliorating properties are most conspicuous in a *clay* soil, or rather in a *stiff* loam. A good proportion of decomposed vegetable matter adds greatly to the beneficial effects of lime; and hence our farmers are desirous to mingle as much barn-yard manure as possible with their lime dressings, and to get their fields into what is called a good sod, or turf, full of grass roots. Then, a dressing of lime has an admirable effect.

Yard manure is not generally mingled with the lime when the latter is first applied. The practice is to lime the Indian corn ground prior to planting that grain on the inverted sod; and, the ensuing spring, to manure the same field for a barley crop; or to reserve the manure until the succeeding autumn, and apply it to the wheat crop.

The soils indicated by a natural growth of black oak, walnut and poplar, and those in which such grasses as the *poas* and *fustucas* best flourish, are generally most signally benefitted by the use of lime. In short, I may observe that lime has been found more or less beneficial in every description of soil in this district. It is most so in hilly or rolling lands, where clay predominates; less permanently so among the mica slate; and least of all on the magnesia rocks. The soil on these last is rarely worth cultivating.

The quantity of lime, per acre, which can be used advantageously, varies with the condition and original character of the soil. Highly improved land will bear a heavier dressing than poor land. On a soil of medium condition, the usual dressing is forty to fifty bushels per acre. A deep rich soil (or limestone land in the great valley) will receive seventy to eighty, and even one hundred bushels to the acre, with advantage. On very poor land, twenty to thirty bushels per acre is deemed most advantageous to commence with.

The application is usually repeated every five or six years; that is, every time the field comes in turn to be broken up with the plough, and as the land improves, the quantity of lime is increased. The prevailing practice here, (Chester county,) is to plough down the sod or *lay* in the fall, or early in the spring, harrow it once, and then spread the lime, previously slacked to a powder, preparatory to planting the field with Indian corn.

Every field, in rotation, receives this kind of dressing; and as our farms are mostly divided into about half a dozen fields, the dressing of course comes once in six years, more or less, according to the number of the fields. Some enterprising farmers, however, give their fields an *intermediate* dressing *on the sod*, after they come into grass; which is considered an excellent practice, tending rapidly to improve the condition of the land.

The manner of applying the lime is as follows:—It is usually obtained in a caustic state from the kiln, deposited in heaps in the field where it is to be spread, and water sufficient to slake it to a powder is then thrown upon it. As soon as it is slaked, it is loaded into carts, and men with shovels distribute it as evenly as possible over the ground.

The crop to which it is usually applied is Indian corn, in the spring of the year: say the month of April. Occasionally it is applied preparatory to sowing wheat, in autumn. When used as a *top-dressing*, on the sod, it is generally applied in the fall. The prevailing opinion is, that it is most advantageously applied to the corn crop, and hence the general practice. But the truth is, it is highly advantageous at any and at all seasons."

The advantage of lime is threefold, each distinct and separate. 1. It is a *Neutralizer*. 2. It is a *Decomposer*. 3. It is a *Converter*. 1. Lime acts as a neutralizer in all soils in which phosphoric or the other acids exist in a free state. 2. The geate of alumina, the least of all demanded by plants, frequently abounds in soils. Long formed and sun-baked, they are scarcely acted on by rain or dew; but lime decomposing these metallic and earthy geates, forms a combination which, in its nascent state, is readily dissolved. It is therefore a decomposer. 3. But the great use of lime is as a *converter*, turning solid and insoluble geine, and even solid vegetable fibre, in the soil, into soluble vegetable food.*

Gypsum, otherwise *sulphate of lime*, or *plaster of Paris*, as it is sometimes termed, from having been dug in great quantities from the quarries at Mont Martre, is a fossil, of which one hundred parts of that kind chiefly used as a manure

* Dr. Dana's letter.

have been described by CHAPTAL as consisting of—pure calcareous earth or lime, 30 parts; sulphuric acid, 32 parts; and chrystallized water, 38 parts. It dissolves in about 500 times its own weight of water, is reducible to powder in the fire, but is almost as difficult of fusion as limestone, and loses by calcination about 20 per cent.

When pure, it does not effervesce with acids, is insipid to the taste, and free from smell; but there are other sorts which vary in purity, and hence the analysis of chemists may differ in the accounts of its properties. There is, however, a very simple method of testing its quality, common in the United States, which consists in placing a quantity of it, pulverized, into a dry pot over a fire, and when heated it gives out a sulphurous smell. If the ebullition, or bubbling, which then takes place, is considerable, the plaster is *good;* but if not, it is considered *indifferent;* and if it remains motionless like sand, it is deemed *worthless.*

We owe much to the late RICHARD PETERS, Esq., for the enlightened zeal and perseverance with which, years since, he laboured in introducing this valuable mineral to the favourable notice of farmers, in the face of the most violent opposition. But all opposition was happily surmounted; and this valuable substance soon assumed, and still occupies, its proper rank among manures.

The use of gypsum as a manure, though only within the last few years brought into general practice, is not a modern discovery, for traces of it are to be found in the writings of the ancients. It was not, however, until about the middle of the last century, that public attention was attracted to it, its properties as a manure being then accidentally discovered in Germany by a labouring hand, employed at a quarry of that substance. This person (his name should have been preserved) had occasion frequently to pass across a certain strip of meadow to shorten his distance home; and being an observer of things, he was struck with the luxuriance of the grass where he had walked; and supposing it to be caused by the dust of the gypsum from his feet and clothes, made experiments which verified his supposition.

JUDGE PETERS, in the Memoirs of the Philadelphia Agricultural Society, vol. i. page 156, gives the following account of its first introduction into the country: "The first I saw of the agricultural effects of gypsum, was several years before the commencement of the revolutionary war, on a city lot on the commons of Philadelphia, occupied by JACOB BARGE. He was the first person who applied the gypsum in America to agricultural purposes, but on a small scale.

Burr-millstone makers and stucco-plasterers were the only persons acquainted with any of its uses. From a manufacturer of the former I procured a bushel, which enabled me to begin my agricultural experiments, and I faithfully improved and extended them as I obtained more means.

A quantity, imported as ballast, twenty tons I believe, in a vessel engaged in the London trade, and thrown out on a wharf, without knowledge of its value, was the first important foundation on which this extensive improvement to our husbandry was established.

With this, Mr. BARGE began the business of pulverizing the gypsum; first in a hand, subsequently to this in a horse-mill, and soon afterwards it was carried on in a water-mill. When I had convinced myself of its efficacy, I disseminated the knowledge I had acquired through many parts. But my success in obtaining credit to my assertions, or in procuring assistance in prosecuting my experiments, was, for a length of time, very limited and discouraging. I had no concern in the manufacture, or any other object in the communications, but one founded in a desire to propagate a knowledge of this valuable acquisition."

The soils to which it is the most congenial are the light, dry, sandy, gravelly and chalky; to heavy loams, strong clays, and to wet land, it seems to yield no benefit, unless the former happens to be well limed.

Upon exhausted land, or upon soils containing little vegetative mould, or deprived of putrescent manure, it will prove powerless, but it succeeds well after an application of dung, or of green crops ploughed down. It produces, also, more effect in dry than when laid on in wet weather.

A watery temperature, at least, arrests its effects, and seems even to suppress them altogether if the gypsum has been calcined; but it should be observed, that this only occurs if rain falls soon *after* its application, for if it happens *previously*, its moisture upon the plants will be found very useful. This peculiar property has given rise to many mistakes, and occasioned much of the prejudices which exists against it in certain localities.

The late Col. JOHN TAYLOR, of Caroline County, Virginia, states in substance that he sows of plaster from three pecks to one bushel per acre. Sown on clover, especially red top, in the spring, its benefit is very striking. The best way of using it is in the spring upon the long manure of the preceding winter, to be ploughed in with it. He regards it as an important ally, but by no means as a *substitute* for manure. There should be intervals allowed of two, three, and four years, between applying it to the same land.

"Within the last ten years," says Col. TAYLOR, "I have used between two and three hundred tons of gypsum, in a variety of experiments, which have produced the conclusion that it increases very considerably the product of vegetable matter in almost all its forms. Except when sown on clover, which it benefits almost at all seasons, I have found it succeed best when covered. Its immediate benefit to Indian corn is vastly greater than to any other crop, clover excepted, while its benefit to the land is equally great."

All crops are ultimately improved by its improving the soil, even when its effects are not immediately visible. It is recommended as a top-dressing for clover, only, by Col. Taylor; but others, who speak with great confidence, say that it is appropriate to the artificial grasses and leguminous plants. It has also been known to improve materially the sward of mossbound pasture. It is recommended to harrow it in with oats, when applied to that crop, in preference to sowing on the surface after they are up.

It has been fully ascertained by repeated experiments, that a liberal application of plaster to clover at the time of turning down and preparing for a wheat crop, is far more beneficial to the crop, and much preferable to turning in the clover in the usual way and plastering on the surface.

The action of the plaster upon the clover thus covered over, and thereby excluded from the influence of the atmosphere, is instantaneous; and the putridity is so certain as to cause considerable gas, which in its passage impregnates the sod with all its fertilizing qualities, while the roots shoot down and feed on a bed of manure.

It is usually sown by the hand, at the time when the leaves of the clovers and other plants begin to cover the surface; and the operation is performed, if possible, during still damp or slightly stormy weather, it being beneficial that the leaves should be somewhat moistened, so as to retain a portion of the dust. The effect of this slight application is felt for several years. It should be ground in fair or good weather, and spread shortly after; and it may be sown either in spring or autumn, but vegetation must have first put forth. An old cultivator says that when clover seed is sown clear from the hull without covering, it ought to be rolled in plaster, and it will preserve it in a moist state and promote its vegetation.

III. MARL.

No form of matter whatever, known to us at this time, is more valuable in agriculture, in the regions where it abounds, than rich marl, which in some one of its forms is widely disseminated over our country, stretching from New Jersey to Georgia and Louisiana, and from the seaboard to the highlands, or primitive formations in the interior. The existence of exhaustless stores of this fertilizer of the soil in New Jersey, and its value as an agricultural agent, was known before the revolution; yet, strange to say, little or no attention was paid to it until within a few years past. The first successful trial of marl as a manure, was made, we believe, in the neighbourhood of Pemberton, Burlington county, New Jersey, about the close of the last century. The first notice we find of it is in a paper "On a new mineral manure for clover," by JOSIAH REEVES, of Rancocus Creek, Burlington county, N. J., read before the Philadelphia Society for Promoting Agriculture, Dec. 9, 1806. He says—

On my farm, and throughout our neighbourhood, it abounds near the surface in the meadows, and generally in the banks and hill sides. The depth of the veins not definitely ascertained—varying, Mr. REEVES thinks, from six to fifteen feet. "The result of my own and my neighbours' experience is, that for grass lands (the basis of all good husbandry) about ten two horse loads to the acre, laid on the surface in autumn, is better, if the next season prove moist, than double the quantity of any other manure, and will last longer—changing in two years rough-bound meadow into almost clear white and red clover. But the last dry summer it did very little good. I am in the practice of mixing in my barn-yard, or in the compost heap, the marl with the dung, two loads of the former with one of the latter, and always find that it is as good, if not better than the same quantity of dung alone.

Mr. REEVES furnished the late Dr. SEYBERT with the specimen he analyzed—we believe the first submitted to chemical analysis.*

Notwithstanding this conclusive evidence in favour of marl, from a source entitled to the highest credit, it was regarded with great caution; its progress of course was tardy, and we hear but little more of the subject until about the year 1813. The fifth volume of the Memoirs of the Philadelphia Society contains a communication dated Evesham, N. J., 9th mo. 20th, 1815, on the New Jersey marls, by MARK REEVES. This was a lucid article, and performed its office by directing the attention of public spirited men to the subject. This valuable contribution to the Memoirs was followed by another, from the pen of a gentleman, now no more, but whose moral worth, and great practical knowledge, endeared him to the circle of his friends and the community at large. We refer to the late Dr. GEORGE HOLCOMB, of Allentown, N. J., who was struck down by the hand of death in the midst of years and usefulness. His paper on New Jersey marls was written Sept. 30, 1815, ten days after that of Mr. REEVES; and, from one of the following extracts, we learn that on one farm, at least, in the county of Monmouth, it had been in use for twelve years, with the greatest benefit. Dr. H. gives the following cases of extraordinary production, in order to exhibit the surprising effects of marl at that period.

* The analysis made by Dr. SEYBERT gave, silica 49.83—alumina 6.92—protoxide of iron 21.53—potash 10.12—magnesia 1.83—water 9.80, in the 1.00 grs.

A gentleman in Burlington county grew a very superior crop of Indian corn from a certain field; a crop of rye—after the Jersey manner—immediately followed it. The same field, the same season, yielded a heavy burthen of clover; and to complete this excessive cropping, exhibited in the fall as large a growth of buckwheat as the neighbourhood had ever seen. This uncommon productiveness was solely the effect of ferruginous marl. Ten years ago, the field was covered with India-grass—an uninclosed barren.

A farm in Monmouth yielded, according to the opinion of an observing neighbour, from ten to twelve bushels of Indian corn per acre. The quantity of grass cut, was limited in the extreme. The free use of marl for twelve years has covered this farm with the richest grasses—and from one of its fields the last season, sixty-three bushels of shelled corn were gathered (to the acre).* This, I apprehend, was as fine a crop of corn as any ever grown, under the same circumstances, in the United States. It was planted in hills five and a half feet apart, and a considerable portion of the field, for the last twenty years, had not received the benefit of a single shovel of stable manure. The farm has been under tillage nearly a century.—*Dr. George Holcomb.*

The same volume of the Memoirs contains the testimony of George Craft and Paul Cooper, both of Gloucester county, in favour of marl as a manure, and detailing the astonishing effects produced by its application; the former entertained so high an opinion of it, from a previous trial, that during the winter of 1814–15, he hauled two hundred loads of it to his place, from a pit situated at a distance of five miles; and in doing so, he was amply compensated.

Marl is found, as has been before remarked, in various portions of our country, but never, we believe, within the limits of *Primitive* formations, being confined in the "United States, perhaps, exclusively to the *Tertiary* (or secondary) formations, and the alluvial and deluvial deposits, which lie principally on the seaboard, and are of recent date compared with other formations." Professor Rogers states, that the shell marls of Delaware, Maryland and Virginia, and the other states still farther south, contain, not unfrequently, as high a per centage of the green-sand as does the sea-beach upon the coast of Monmouth county in New Jersey, which he represents in his Report as rendering, by its application, the most sterile patches of sandy soil capable of sustaining very admirable crops of corn. That this powerful agent in agriculture is widely diffused from the primitive formations of New Jersey, along our southern seaboard, no doubt is now entertained; and all that remains to bring the soil in this immense region, now mostly sterile, having been cropped to death, to the highest grade in the scale of fertility, is a judicious and persevering use of the

* The marl in this quarter (Mount Pleasant, Monmouth county,) has been known and used as a fertilizer for forty years. It is applied very profusely—one hundred loads to the acre, or even more, being no unusual application. The improvement is very permanent, changing the natural growth from Indian-grass and five-finger, (or *cinquefoil*,) to fine white clover. White alder, and other plants of rich soils, abound in the marl meadows.—*Rogers' Geological Survey*, 1836, p. 46.

regenerating means, placed by the author of all good within the reach of the planter and the husbandman.

The Peninsula formed by the state of Delaware and the Eastern Shore of Maryland, abounds with this fertilizing agent in almost all its varieties. It is pretty well established, we think, that Mr. JOHN SINGLETON, of Talbot county, Maryland, was the first person who discovered the existence of marl in that state, which he states was in August, 1805. The next year he applied it with marked advantage to the soil. The result was encouraging, and he continued the use of marl from that period. His intelligent neighbours gradually followed his example.

We have thus briefly sketched an outline of the history of this important agent in agriculture. It seems that its value as a fertilizer of the soil was long since known and acknowledged—yet, nevertheless, in the face of great practical results—the transformation of the sterile common to the fertile field—such were the prejudices of the great mass, that, although they could not discredit the evidence of their own senses, still they were slow of faith, and hesitated for a long time even to make an experiment.* The Philadelphia Society did much to bring the subject before the people—but to a few individuals of that early day, are we mainly indebted for the information disseminated. In this rank the late Judge PETERS was foremost. His coadjutor, Dr. JAMES MEASE, who still lives to witness the wonderful effects produced in our country by the application of science to agriculture, laboured diligently to develope the vast resources of these beds of mineral manure, placed by a bountiful providence within the reach of man, so as to enable him to render fertile, beautify and adorn the soil on which he had placed him. In this good work, many very intelligent Jerseymen exerted themselves to the utmost. They were not willing to reap the advantages alone, but were anxious that their neighbours should participate with them. The names of many individuals might be here introduced, who took an active and early stand in disseminating a knowledge of the value of marl, among the farmers of New Jersey and the adjacent states—both by *precept* and *example*.

* A very intelligent and observing old gentleman of Philadelphia, in conversation with the writer of this some time since on the subject of marl, observed, that many years ago he used occasionally to visit Haddonfield, and that on explaining to the inhabitants the advantages of marl, and the necessity of their applying it to their lands, in order to bring them up in the scale of fertility, and compete with their neighbours on the score of improvement, he found many of them faithless—trouble, labour and expense, book-farming, &c., were as so many lions in the way. Said the old gentleman, I could not but observe to them, that they held a shilling so near the eye that they could not see a dollar afar off.

Immense beds of astringent clay, denominated spurious marl, from its pernicious effects when applied in large quantities to the soil, are to be found in the marl regions of New Jersey. This bad effect on the soil and vegetation, is owing mainly to the astringent ingredients combined with it, such as copperas and alum-earth, which produce a powerful acid reaction. But these pernicious qualities can be corrected, and the marl or clay rendered subservient to the agriculturist in the production of his crops. Professor ROGERS, in his Report, says, that if this clay be dug several months before it is to be used, and spread out in broad, shallow, flat heaps, exposed to the action of the atmosphere, and where the rains may penetrate it, carrying off the copperas and alum-earth, which it is known readily dissolves in water; and as the green mineral does not dissolve in water, it sustains no loss in its fertilizing qualities by its exposure to the rains. This clay contains a portion of the green granular material of the true marl—but the operator should be very careful in his experiments. A year or two will be sufficient to determine its value, the time of its exposure to the atmosphere, the best method of its preparation, and the quantity and manner of its application. But the following simple and effective process is to be preferred.

Add to every heap of this spurious astringent marl, a small quantity of *freshly burnt lime*, and mingle them thoroughly together. The sulphuric acid of the copperas or alum-earth, or of both, if present, will pass over to the lime, and form sulphate of lime, (*gypsum* or *plaster*,) the value of which, as a stimulant to vegetation, is well understood; the other ingredients, the oxide of iron and clay, will, on being liberated, contribute also towards improving the texture of the soil should it be sandy. A bushel of lime to every hundred bushels, or five tons of the mass (we would recommend double the quantity of lime) will, in most cases, be sufficient to neutralize all the astringent matter present, and to convert it into, or rather replace it by, *gypsum*. The dressing of an acre of such a mixture will contain of the green-marl, of gypsum, and of uncombined lime, or more truly lime now in a state of carbonate, in all probability fully enough to impart to the soil a most decided improvement in its fertility.

This marly clay is not only easily divested of its injurious properties by the action of lime, or exposure to the atmosphere, but it may also be rendered of vast advantage, by adopting the practice of the English farmers—that is, making a *compost* of the substance with the common manure of the farm.—See English Farmers' Reports, No. IX. When a field is over-limed, the best remedy is the application of putrescent and vegetable manures. So when a field has become sterile by an over-dose of this marly clay, a certain remedy will be found by applying to each acre a few bushels of lime—which will very speedily correct the acidity in the soil communicated by the astringent clay.

Directions for the Selection and Proper Mode of Applying the Green-sand Marl. In seeking for the marl stratum in neighbourhoods where it is supposed to occur, but where a covering of any of the superficial deposits obscures it, the primary point to be remembered is, that the true marl is the lowest deposit of the region. We should find out, therefore, the *deepest impressions* of the land, as the meadows and natural ravines, and by the use of an auger or other instrument for probing the ground, several feet in length, we may very frequently ascertain whether the stratum lies sufficiently near the surface to be easily and economically uncovered. A pretty sure guide to the marl may be found in some places from the aspect and composition of the earth upon and near the surface. Should it be at all *greenish*, or contain, on close inspection, any of the green granules, the probability is pretty strong that the marl lies beneath, at a very moderate depth, and the likelihood of this is augmented when we find our borings bring up an increasing proportion of this mineral as we descend deeper. I have repeatedly found the position of the marl stratum indicated by the trickling forth of the water from the foot of a bank, for the water is almost invariably seen to issue along the top of either the dark clay or the true marl.

For judging of the quality of a marl by observation, some familiarity with the multiform aspects which it puts on is indispensable. The leading rule, however, is, to bear in mind that the fertilizing efficacy of the compound, resides in the minute round greenish grains which compose more or less of it, or sometimes all of it, and that it seems, moreover, to be dependant upon the proportion which these green grains contain of those powerful alkaline stimulants to vegetation, *potash* and *lime*, but more especially potash. The first thing, then, is to approximate to the relative quantity of the green grains in the whole mass, and this may he effected, to a greater or less degree of accuracy, in several ways. The simplest and surest method is to employ a small pocket magnifying-glass (a common burning-glass will answer,) and to make the eye familiar as soon as possible with the dark green grains, so as to distinguish them at once from other dark varieties of sand which sometimes occur associated with them. A little practice will very soon enable one to use the glass expertly, and to arrive at a pretty true estimate of the probable per centage in which the green grains may exist. But as these granules cannot sometimes be distinguished from the grains of ordinary white flinty sand, or from other kinds, in consequence of the particles being *all alike coated* with a thin film of the dark cementing clay, it will be useful to devise some method of bringing out under the magnifier their different characteristic traits of colour and form. Let the mass be washed in a large glass tumbler, and repeatedly agitated with the water, until as much of the clay as possible has been detached from the grains. After pouring off the turbid water by repeated rinsings, and permitting it to settle until clear, we may estimate the comparative quantity of clay in different marls by the relative amount of sediment which subsides. If we wish to be more accurate, we can weigh out a given quantity of the marl, then pursue the above plan, and decant the clear water from the clay, and after thoroughly drying the clay, weigh it to ascertain its amount. Having got away most of the clay, we should spread out the granular matter upon a sheet of paper and dry it, when there will be no farther difficulty in distinguishing, by their colour and lustre, the foreign impurities, from the grains of the true marl, and also of estimating the relative abundance of each. When the marl to be examined contains much clay, I would recommend the experiments to be made upon a regularly weighed quantity, weighing both the clayey and the granular portions. A delicate apothecary's balance will commonly be found accurate enough. Another more expeditious, though less accurate method, is merely to dry the marl, and spread it extremely thin upon a sheet of white paper, and then to hold it near a window or in the light, and to examine it carefully by the magnifier. The flinty sand, though stained with clay, may then be clearly discerned, in consequence of its transparency, whereas when we inspect a solid lump, all the particles upon the surface are nearly alike dark.

A good suggestion is, to place a portion of the marl upon a hot shovel or on the top of a stove, when all the marl grains will change from their ordinary green to a light red or brick colour, while the other materials of the mass sustain little alteration. This will often make it obvious to the naked eye in what proportion the green grains are present.

When there is a yellowish or whitish incrustation upon the marl in a bank, after the *moist* surface has remained for some time exposed to the weather, it is indicative of the existence of a portion of copperas or alum-earth, the hurtful nature of which has already been explained.

An astringent inky *taste* will very often detect the presence of these noxious substances at times when no such efflorescence shows itself. If the quantity be too small to betray itself distinctly to the palate, and we are still in doubt as to their presence, other more rigorous tests are within our reach, and as these astringent matters are so unquestionably pernicious in their action, it must be of importance to have the means of determining in what proportions they abound in different marls. This can be effected with precision only by a systematic chemical analysis, but their existence can be made to appear by the following test. Put a small portion of the marl in a flask or other thin glass vessel, pour upon it some pure water, and heat it moderately. After causing the water to dissolve in this way as much as possible, remove the heat, and let it settle, then decant the *clear* fluid into some glass vessel, such as a wine-glass. If there has been any copperas present, it will be proved by adding to the fluid a little lime-water, which will produce a milky turbidness, that after a little while will become stained of a yellowish-brown colour. The milkiness is owing to the formation of gypsum, and the brown colour to oxide of iron from the copperas. Or in lieu of this, add a solution of oak bark, and if copperas be present, we shall have a dark inky colour at once produced.

A good marl will, upon being squeezed in the hand, fall asunder again rather than bake into a tough doughy mass, and upon being left in heaps to dry will retain a light greyish-green colour and be extremely *crumbly*. It seems to be a very general characteristic of the better class of marls, that they throw out a white efflorescence or crust, upon those grains which are most exposed to the air. Hence the very light colour externally, which some heaps of marl possess. This crust consists of the sulphate of lime (gypsum) and carbonate of lime, but more usually of the former. A drop or two of strong vinegar or any strong acid will produce an efflorescence or *frothing* if it be the *carbonate* of lime, and should nothing of this kind take place, we may set it down to be *gypsum*. Of course, from the minuteness of the quantity of the white coating, much care and nicety of observation are demanded in doing this, in order to avoid erroneous conclusions.

I do not state that marls equally good with that kind having the efflorescence do not very frequently occur and exhibit none of this white incrustation.

It does not seem that any general rule can at present be safely given for distinguishing the fertilizing properties of a marl by its *colour*. The truth of this must appear from what has been said about the peculiar shade of colour being so frequently owing to the colour of the intermingled *clay*. When the mass, however, is comparatively free from clay or common sand, and consists of little else than the single material, the green-sand, my observations go to establish that the rather dark green variety is more potent in its effects upon the land than the very light green which sometimes overlies it.

The presence or absence of shells I look upon to be a point of but little moment, for I find that several of the most active marls in the region, show no traces of fossils in them. The whole amount of carbonate of lime in the shape of fossils, and in that of the occasional white incrustation upon the grains, can in very few instances amount to *one per cent.*, while as my analyses show that the lime chemically combined with the other ingredients in the green grains, is sometimes as much as *ten per cent.*, and that the potash amounts almost to *fifteen per cent.*

There yet remains, however, the most important, and by far the most difficult inquiry, namely—into the *exact* constitution of the green grains, in order to determine the per centage of the several ingredients—or, in other words, the richness of the marl in *potash* and *lime*. I had entertained hopes, that the external aspect of the grains might perhaps depend in part on the presence and proportion of these bodies, and that *mere inspection*, after multiplied analyses were made might enable any one with certain directions, to inform himself whether a marl abounded in these essentials or not. But, I find that so far from being a mineral of definite and constant proportions, as some mineralogists have regarded it, the green-sand is in fact a compound, which fluctuates widely in its external characters and in its chemical composition.

Though it is not presumed that among those engaged in agriculture, more than a very few persons possess the requisite chemical skill, or the facilities for this species of research; yet, for the sake of enabling those to execute it, who may chance to be competent to this kind of analysis, I have thought it well to introduce a statement of my method of analyzing the mineral in question. Several plans, modifications of the same general method, have been tried for the purpose of arriving, if possible, at some mode sufficiently simple to make it practicable by those who possess but a limited knowledge of chemistry. But the nature of the compound seems not to admit of either a very direct or expeditious course of operation, and though practice has taught me the steps which are the most certain and least operose in the case, I can hardly hope, that the analysis of the green marl can at present be brought within the skill of such as are not already professionally familiar with this laborious and intricate art.

Method of Analyzing the Green-sand.—(*a*) Digest the mass in a flask of pretty strong muriatic acid, by a sand-bath heat for at least three days, or boil it actively for five or six hours. Everything is dissolved but the *silica*, which must be filtered, ignited, and weighed. (*b*) Precipitate the *oxide of iron* and *alumina* by ammonia and estimate them together, or detach the alumina by *caustic potash.* (*c*) Evaporate the ammoniacal solution to total dryness, and heat the mass to incipient redness, to expel the muriate of ammonia. There remain the chlorides of calcium, magnesium, and potassium, which redissolve in water, dividing the liquor. (*d*) To one half add oxalate of ammonia, and separate the lime, then by ammonia and phosphate of soda separate the *magnesia.* Subtract the combined weight of these two computed as chlorides from the original triple chloride, and we have the *chloride of potassium.* (*e*) Now evaporate the other half again to dryness and dissolve up all the chlorides of calcium and magnesium by *alcohol*, and dry and weigh the residual chloride of potassium. If further check is necessary, convert this into chloroplatinate of potassium and estimate the potash from this.

Mr. Pierce, in a Survey of the Alluvial District of New Jersey, furnished for Silliman's Journal, thus describes the use and effects of marl:

"I visited many beds of marl, and found them of a pretty uniform character. The colour is generally grey or greyish-white, and good in proportion to its whiteness, which indicates the quantity of calcareous earth it contains. From thirty to eighty loads of marl are spread upon an acre. It is believed that a good dressing will last from twelve to twenty years. The lands of Monmouth county alone are said to be enhanced in value more than half a million of dollars by the discovery and use of marl.

"A respectable farmer of Middletown mentioned to me that a few years since he contemplated abandoning his large farm for land in other districts, as his own was unproductive. Learning the discovery of marl, he made himself acquainted with the mode of examining, and found good beds of this manure in almost every field, and liberally applied dressings to the soil. In walking over his ground, I observed rich white marl breaking out of banks and hillocks, and the streams paved with marine decaying shells. For more than a century this land had been regarded by the proprietors as worn out and useless.

"This farm in its improved state exhibited a gratifying sight. The hills, were formerly thorns, thistles and mulleins, disputed the dominion, now supported luxuriant corn. Extensive verdant meadows, where numerous stacks of grain and well filled barns evinced the productiveness of these fields, which are now estimated at three times their former value."

Salt is, probably, as essential to the health of vegetables as of animals, and it is reasonable to believe that a mineral thus widely diffused performs important functions. It exists in all plants, is a constituent part of almost every kind of animal and vegetable manure, and is found in most soils in sufficient quantity for the purposes of vegetation.

Experiments with salt as a manure, have in most cases failed, or been of doubtful success. That in many cases, salt applied in small quantities has been useful, can hardly be questioned. These, we may believe, were cases comparatively rare, where there was a deficiency of salt in the soil for the use of the plants, or where it was not supplied in sufficient quantity by the ordinary manures.

Though salt can rarely be applied with advantage directly to the soil, and ought never to be employed at hazard, without its being known whether the salt of the soil is really deficient, yet there is reason to believe that, in various cases, it may be applied along with other substances with manifest advantage.

Salt, in small quantities, is said to assist the decomposition of animal and vegetable matter; and a portion of it mixed with ordinary composts of earth and lime, appears to increase their fertilizing properties. "By the information which I have been able to collect, I am induced to consider salt, when sparingly applied, as an admirable manure, especially for fallows and arable land, and when mixed up with soil out of gutters, or refuse dirt and ashes, to be very valuable on grass lands. My own experience convinces me that it is very powerful in destroying vegetation, if laid on *too thick*."*

The "Complete Grazier," which is considered a standard work by English Farmers, says, that "salt is of singular fertility on pasture lands; on which, when it is properly scattered, cattle thrive very speedily; besides which, it not only improves and increases the herbage, but also sweetens sour pastures, while it destroys weeds and noxious vermin."

That celebrated chemist, SAMUEL PARKS, in his great work on Chemistry, says, "In a conversation with a gentleman who has spent many years of a valuable life in making experiments on the employment of salt in agriculture, I was informed that

* Lord KENYON's Reply to the English Board of Trade.

one bushel to the acre makes land always more productive, but that a larger quantity would for two or three years afterward render it actually sterile." See Appendix C.

We cannot, however, recommend salt, as a general manure, to any extent, as the application of it is attended with considerable hazard. If too heavily applied, it will not only diminish, but completely check vegetation. Experience is entirely opposed to the indiscriminate application of common salt in any considerable quantity to land.

Potassa, (potash,) acid, and forming the well known substance saltpetre, has been employed as a manure, and apparently with very good effect. It is found in greater or less quantities in all vegetables; *soda,* generally in plants growing near the sea, (sea-weeds, as we have seen, form a good but not a lasting manure,) or in soils impregnated with marine salt. The saline combinations of potash are expensive, and this is probably one great objection to their general use; for, there is reason to believe that potassa, like lime, exercises a certain influence on the soil, by rendering soluble, certain substances which were insoluble.

Some persons are of opinion that the astonishing effect produced on vegetation by the application of the green-sand or marl of New Jersey, and other localities, is in due proportion to the predominance of potash in its composition, without reference to the other ingredients which are in combination with it. Sure it is, that marl, in which neither lime nor potash is present, is considered valueless.

Potash was known to the ancient Gauls and Germans, and soda was familiar to the Greeks and Hebrews. This latter substance, which is found native in Egypt, and is there called *natron,* was known to the ancients by the name of nitrum.

The whole subject or range of *saline manures,* it is to be observed, deserves more extended investigation than it has yet obtained. That all saline bodies which exist habitually in plants are beneficial to vegetation, we may almost, from analogy, infer. We see this in the case of the carbonate of lime, the sulphate of lime, and the phosphate of lime, and it is not unreasonable to infer that all saline bodies which exist in plants in their common state, may be employed as manures.

The knowledge in which we are now deficient, regards the quantity in which these substances should be applied. The carbonate of lime is that in which it appears the greatest latitude may be given. The sulphate of lime acts in smaller quantity, and so likewise does the phosphate.

Common salt, supplied in small quantities in manures, promotes vegetation, while a larger quantity is injurious; and the sulphate of iron, a substance poisonous in excess, if applied in the quantity suited to the wants of plants, seems eminently calculated to promote the vegetation of the plants, and the fertility of the soil.

Ashes of every description, including soaper's waste, though not all falling strictly under the character of fossil substances, and, indeed, being partly derived from the vegetable kingdom, yet, partaking in a great degree of the same calcareous nature as those of which we have already treated, may also be allowed to rank together under the general denomination of mineral manures.

IV. MIXED MANURES.

This class of manures consists of those derived partly from organic and partly from mineral substances. *Ashes* of fuel of different kinds used for domestic and other purposes, may be said to be of this class. Ashes of anthracite coal are to be regarded as a manure of very inferior quality, its principal virtue consisting in the ashes of wood, &c., of which it most generally contains a portion, with various other extraneous substances.

Coal ashes, however, have been found highly serviceable, when applied in sufficient quantity to tenacious or stiff and clayey soils, and are therefore valuable in cities and large towns, if soils of this description abound in the vicinity. They have been applied in large quantities to clayey lands in the vicinity of Philadelphia, with manifest advantage. One of the shrewd, intelligent, money-making farmers of the county, assured the editor that he had experienced great benefit by top-dressing his grass lands with coal ashes, previously sifted.*

Soot is frequently applied in its unmixed state as a manure. Its base is charcoal, and it is advantageously spread upon all soils, and in an especial manner upon land in grass.

The *sweepings of roads* are frequently used as a manure,

* This gentleman said he obtained several hundred bushels of the ashes, which cost him nothing in the city; they were also generally return loads. They were always put under cover, sifted in rainy weather, and applied to the land as occasion required. His plants and vines were regularly dusted with the sifted ashes, and almost generally escaped the ravages of insects. But there was another advantage connected with this operation, which did not occur to him until he commenced sifting the ashes. He found large quantities of unconsumed coal; most of it, to be sure, partially burnt, but still sufficient both in quantity and quality to keep him in two coal fires throughout the season.

and may be always capable of being rendered so by being fermented with lime. They consist of various minerals, ground, or very finely pulverized, by the action of carriages. They form mud in wet weather; and where the country is thickly settled, they are much mixed with animal and vegetable matter.

Street manure, or the general refuse of towns, is a very compound substance, and of great importance to the fertility of the adjacent country. It consists of all kinds of offal, of the refuse of manufactories, of litter and the dung of animals, and a large quantity of ashes and vegetable substances.

This species of manure is much valued, though it is far inferior to well rotted dung, the produce of the farm-yard. In every town this substance ought to be carefully collected for the supply of the neighbouring country.

There is a method of increasing the quantity of manures upon a farm, which should in no case be neglected. This is by forming *composts*, which, as the name denotes, are a mixture of substances, [see page 30.] If dung, or any vegetable or animal substance, be mixed with the earth, the latter will imbibe a portion of the decomposing matter, and become itself fitted to be used as a manure.

The earthy and putrescent matters may be laid in layers, the earthy covering the putrescent, so as to prevent the loss of gaseous matter by evaporation. But it is not necessary to observe the precise order of layers, since the substances may be mixed together whenever they can be conveniently collected.

There should be at least one heap of this kind upon every farm, as a general receptacle for all substances capable of being fermented, which may from time to time be procured. Urine, soapsuds, and the like, poured upon such a heap, will be found to be very beneficial; and lime, in small portions, may be mixed with it. The whole should be thoroughly turned over several times, so as to mix the materials together and promote fermentation.

Of the nature of composts, also, are those mixtures of lime with weeds, the mud of ponds, ditches, creeks, rivers, and the like, to which reference has been already made. No opportunity should be omitted of making manure by this method.

The management of composts of all kinds is exceedingly easy. The knowledge that every sort of putrescent refuse may be mixed with earthy substances, that lime acts beneficially in fermenting the mass, that frequent turning mixes the substances together and produces the action required, are sufficient to guide the farmer in all cases in this simple but very important branch of farm economy.

III.—SIMPLE OPERATIONS OF TILLAGE.*

I. PLOUGHING.

In ploughing, a slice of earth is to be cut from the left hand side, and to be turned over to the right hand side. In this operation the left hand or near side horse walks on the ground not yet ploughed; the right hand or off side horse walks in the furrow last made, and the workman follows, holding the handles of the plough.

By means of these handles he guides the plough, while he directs the animals of draught by the voice and the reins. When he is to turn the plough at the end of a furrow, or when it encounters an obstacle, such as a large stone, he presses down the handles, so that the heel of the plough becomes a fulcrum, and the share is raised out of the ground.

As the perfection of good ploughing can only be atttained by *practice*, it must be evident that nothing like a system can be framed for the operation on every diversity of soil. The following rules, partly those of that eminent agriculturist, the late Mr. Finlayson, who was himself an expert practical ploughman, may be laid down as worthy of being observed by every man who intends to become a proficient in the performance of his work.

The horses should be harnessed as near to the plough as they can be placed without impeding the freedom of the step—for the closer they are to the point of draught, the less exertion will be required to overcome the resistance.

When ploughing with a pair abreast, the most forward and powerful horse should be worked in the furrow. But if the team be harnessed in line, and there be any difference in the height of the cattle, the tallest should be put foremost, if he be in every other respect equal to the other.

When at work, they should be kept at as regular and good a pace as the nature of the work may permit; for they are then more manageable, and the draft easier than when slow. By due attention to this, the heavy soil will also cling less to the coulter, and the land will be found to work more freely.

The breadth and depth of the furrow being ascertained, the plough should be held upright, bearing equally all along on a

[* According to our arrangement, Chapter III. on Agricultural Implements should precede this chapter, but the illustrations of some of the implements noticed, not being at hand, that chapter will appear in a subsequent part of the volume.]

straight sole, and be made to move forward in a regular line, without swerving to either side. The edge of the coulter should also be set directly forward, so that the land side of it may run on a parallel line with the land side of the head, and in such a position that their slant, or sweep, may exactly correspond.

The ploughman should walk with his body as nearly as possible upright, without leaning on the stilts or handles, and without using force to any part, further than may be absolutely necessary to keep the implement steadily in a direct line. He should also be sparing of his voice and of correction to the team—of the former, because too much cheering and ordering only confuses the cattle—and of the latter, because punishment, when often repeated, at length ceases to have due effect, and thus leads to unnecessary beating. These are the rules or principles laid down by Mr. FINLAYSON and others.

It must be apparent that, as every kind of soil has its appropriate qualities, each requires a peculiar mode of tillage. Ploughing, which is the chief operation, ought therefore to be executed according to the nature of the land, and not performed upon any one invariable principle.

On strong clays and loams, and other soils of a deep or rich staple, the plough should go to a considerable depth; whereas, on thin clays and sands, the benefit of deep ploughing is very questionable, especially when incumbent on a sterile sub-soil. On each description of land, distinct modes of operation, and implements of different construction, are therefore absolutely necessary.

Very opposite opinions are entertained by many eminent farmers regarding the proper *depth of ploughing*. But as yet, the application of deep or shallow tillage, to various soils respectively, has not been ascertained upon any settled principle.

The proper depth of ploughing must necessarily depend upon the nature of the soil; but although every intelligent husbandman must be aware of the superiority of those of a deep staple over those which are shallow, still it should be borne in mind that there is a wide difference between the effects of ploughing deeply into land, the vegetative stratum of which is of nearly equal fertility throughout, and that of augmenting a shallow surface of fertile soil, by mixing it up with a sub-soil of inferior quality.

Soils of the very best quality, may be completely exhausted in the course of a few years, by *shallow ploughing;* so on the other hand, soils of an inferior quality, by a judicious system of ploughing, as has been already remarked, may be greatly improved in the staple. This course is recommended to increase the depth of the soil of uplands.

Considerable diversity of opinion prevails among practical and scientific farmers, as to the best *mode of ploughing*. Until within a few years, it was the universal practice, with perhaps an occasional exception, to throw the furrow at an angle of about 45° (degrees).

The advocates of the *level* system of ploughing, are, however, increasing. We do not say that this method is preferable to *ridge* ploughing on *all* occasions; very stiff and wet lands may form an exception; but it appears to us reasonable that this process leaves the land in the best form for the after tillage, and by covering all stubble and green crop completely under, and leaving the surface level, light and friable, fits it for the production of good crops, requiring less strength of team to draw the plough, and less effort of the ploughman to govern it.

William Buckminster, an eminent farmer near Boston, Massachusetts, thus speaks of the latter method.—"The best ploughing is that which most completely subverts the soil and buries beneath it the entire vegetable growth. To effect this a good plough is indispensable. Rough and stony ground may indeed be rooted up by the short rooter plough. Such lands are usually cross-ploughed before planting.—Plain fields require a different instrument; a much longer plough is wanted here, to turn the furrow flat without breaking, and without the aid of the ploughman's foot. Such an instrument runs easier than a short one, because it enters the earth more gradually, as a thin wedge opens wood more easily than a thick one. The furrow rises less suddenly on the inclined plane of the mould board, and falls where it should do, in the bed of the preceding furrow, and completely fills it. To make sure work, the coulter or cutter should not stand perpendicular, but should lean to the right, being placed a little anglewise in the beam for this purpose, and cutting the edge of the furrow slice in a bevil form, it will then shut in like a trap door. Let not my brother farmers be alarmed lest their lands should be turned too flat! If they wish to see them lie edge up, or shingled, one furrow upon another, or broken into short junks, they can use a short rooter or a post, as the Africans do. 'But,' say they, 'the *soil should be light*.' Newly ploughed greensward always lies too light the first summer and requires thorough rolling and harrowing, to prevent its suffering for want of moisture; for unless the particles of earth, &c. come in contact, capillary attraction ceases and the turned sod draws no moisture from the sub-soil. Hence our crops, in a dry season, suffer more on greensward than on old ground.

"There is no danger in laying the greensward furrow too flat, if turned, as it always should be, when the grass is green; that and the roots soon begin to decay, and in our summer months your horses will break through the sod in passing, and demonstrate to you that the furrow does not lie close enough.

"The advantages arising from this mode are, we cover up and set to fermenting the whole mass of vegetable matter that covered the soil—we destroy all the noxious weeds—we render the surface smooth and much more easy to manage, and we avoid making loose and broken sods in seeding down to grass—for the furrow thus laid flat should never be disturbed till a new breaking up after a course of grass crops. If seeded down to grass in this state it will not lie so heavy, and will not want to be disturbed again so soon as if it had been completely pulverized before seeding. Ploughs for our plains should, therefore, be made long—they run more steady and cut the furrows more true: and it is not greensward only that should be turned flat—stubble land, weedy lands, and cornhills, should be turned flat, and that only once till the matter turned underneath is decomposed. In preparing corn land for spring sowing, therefore, a heavy harrow should be first used. Make the surface as level as possible with this, then let the plough turn the soil once over and no more before sowing. This furrow may be as fine as you choose, but when once you have turned this mass of stalks, of weeds, and grass underneath, it is absurd to disturb it during the same week or month—we do much injury by ploughing too often—we undo our own work."

A practice has long prevailed in almost every country, of forming the ground into what are termed RIDGES, so as to admit of the water which falls upon its surface finding a ready egress. This method is deemed necessary in all moist or wet countries; and even in lands so dry that little or no injury will result from stagnating water: such ridges are generally formed on account of their convenience in the different works of tillage.

The direction of ridges must generally be regulated by the sloping of the fields, and the lying of ditches and fences, so that they may promote the main purpose for which they are formed, the carrying off of surface water. But, other circumstances being alike, they should be made to lie as much as possible north and south; and never, when it can be avoided, east and west; for, in the latter case, when the ridges are much elevated, the north side has a somewhat less favourable exposure than the south side.

A very intelligent young farmer of Chester county, J. A., speaking of ploughing, says:—"Ground to be left in a handsome condition after ploughing, should, in all cases, be ploughed in as large lands as possible, for the fewer open furrows left in a field the better—say in a twelve or sixteen acre field, not more than three or four. If a field is to be ploughed twice in succession, in the same direction, the commencement of the lands in the second ploughing, should be at the place of finishing them in the first ploughing. This will completely fill the old furrows, and prevent any increase in their number. But if the field is to be ploughed in a direction transverse to the former ploughing, the old furrows should, before commencing it, be filled by ploughing into them about four furrows, that is, two rounds. This will keep the land completely level, which is far preferable to ploughing it in small lands. By ploughing in small lands, the field will be thrown up into a great number of ridges, and consequently, a corresponding number of hollows. This will not only expose it much more to the action of heavy rains and floods, but it will produce its crops very unevenly, heavy on the ridges, and dwindling in the furrows; but by keeping the surface level and even, the crops will be uniform over the field; nor will it be exposed so much to the danger of being washed into gulleys by heavy rains.

"I would further suggest, that if the field has any declivity, to prevent any action from heavy rains, that the last ploughing given it previous to laying any length of time, be in a direction as near as possible at right angles to the descent of the hill."

II. HARROWING.

The next of the simple operations of tillage is that of *harrowing*. One man or boy drives a pair of horses and a pair of harrows*—though sometimes one person drives three horses and three harrows. The driver walks behind with long reins, which enable him to guide and urge forward the horses; and he must be ready to lift up with his hand or a crooked stick, which he holds for the purpose, the harrows when they are impeded by roots, weeds, or other substances. By lifting up the harrow while in motion, the weeds collected by the teeth, fall down.

This process is of essential use in the culture of arable lands. By it the soil is more thoroughly pulverized; wet weeds, near the surface, are torn out and collected; and the manure is more intimately mixed with the soil. Harrowing is given in different directions. First in length, then across, and finally in length as at first.

Besides the clearing of the ground, a purpose in harrowing is to cover the seeds of cultivated plants. The number of harrowings to be given for this end depends upon the state of the ground and other circumstances. When the surface is matted together by the roots of plants, as in the case of land ploughed when in grass, repeated turns are required to cover the seeds

* Formerly, and still in many sections, the single harrow alone is used.

in a proper manner. But when the land is already pulverized, a small degree of labour is required. Sometimes a single turn will suffice. This is especially the case when the smaller seeds of grains and grasses are sown.

The operation of harrowing is best performed when the land is moderately dry, and in the mornings while the dew is on. When the land is wet, harrowing is as much as possible to be avoided, as well on account of the less efficacy of the operation, as the injury done the ground by the treading of the cattle.

Harrowing of meadow-lands when they become bound, or cold and mossy, is of essential service, and will render them much more productive the following year. The most suitable period is the spring, while the ground is soft. But if the meadow be too wet for spring harrowing, it may be deferred to the drier part of fall. In such cases, a suitable top-dressing before the performance of the operation, would be found highly advantageous.

III. ROLLING.

The *Roller* is employed upon the farm to smooth and consolidate the surface of land in crop or grass, and for passing over grounds newly sown with grain, or that are to be laid down to grass. The great importance of the roller has not, heretofore, been properly appreciated by our farmers—but, we are happy to say, it is now coming into very general use.

All grass lands where the frost has, during the preceding winter, raised part of the roots out of the ground, require the roller to be passed over them in the spring, and many persons, whose testimony is entitled to great respect, recommend its use upon all lands in the spring, where grain had been previously sown, or corn planted, for the purpose of breaking the clods, preventing injury from extreme dry weather, and causing the grain to be collected in harvest with less difficulty.*

It is of great service in mowing grounds, by pressing the small stones into the ground, which would otherwise interfere with the scythe in mowing, as well as by levelling the weeds. Grain, which has been frozen out during the winter, may be essentially benefitted by passing the roller over it, and thereby bringing the fibres of the roots in contact with the earth again.

The roller may also be used to great advantage on any sod

* Farmers' Cabinet, vol. i. page 292.

after being ploughed, by making the ground more compact, which will facilitate the decomposition of the sod, and render it less liable to suffer from the effects of drought. In corn ground, in addition to the above, it prevents the furrows from being moved by the cultivator in the dressing of the corn, and places the ground in much finer tilth than it would otherwise be, with the same labour, without it.

In rolling grass lands it is necessary to attend, in a particular manner, to the condition of the surface to be rolled—if too wet, the ground will be poached by the cattle's hoofs; and if too dry, little or no impression will be made by the roller in levelling the inequalities.

IV. DIGGING.

The plough, the harrow, and the roller, are the essential implements of preparatory tillage. To these, however, and the plough coulter, may be added the *Spade;* which, though properly the instrument of culture in the garden, may be employed occasionally in the field.

Cultivation by the spade, however, though more efficient, is greatly more expensive than by the plough. It may be sometimes employed with advantage, though rarely on a great scale, where the profit depends upon economy of labour.

IV.—PREPARATION OF LAND FOR TILLAGE.

I. FALLOWING.

Fallowing in agriculture is the mode of preparing land, by ploughing it a considerable time, before it is ploughed for seed. Lands are laid fallow either during the summer, or during the winter, according to the nature of the soil and the judgment of the cultivator.

By a fallow is understood a portion of land on which no seed is sown for a given period—usually a year. The object is the exposure of the soil to the action of the atmosphere—the destruction of noxious weeds, &c., by the frequent ploughings and harrowings to which the field is subject. By many it is supposed that the fertility of the soil is increased by this process, and at an expense much less than could be accomplished by the application of manures.

The practice has existed from the earliest ages. The Romans with their agriculture introduced fallows in every part of Europe, where it is generally in universal practice, with the exception of Great Britain. But as a crop was lost every year they occurred, a powerful aversion to *naked* fallows arose, about the middle of the last century, in which some of the ablest cultivators of the day entered the lists, and exhausted, perhaps, all the legitimate arguments on both sides. Arthur Young laboured assiduously to substitute *fallow crops* for the *naked* fallows then in general use.

Yet the practice does not appear to have given way, but rather to have extended on wet tenacious clays—and it is on such grounds only that any one now contends for the advantages of fallowing. The expediency or inexpediency of pulverizing and clearing the soil by a bare fallow, is a question that can be determined only by experience, and not by argument.

The principal advocates of fallowing at the present day, contend for it only on heavy soils, which they say it is often impossible to keep free of weeds—in wet climates—and unfavourable seasons. Under draining, where the soil is cold and wet, is to be recommended, and the whole process of draining and fallowing to be effectually done. By this means the succeeding crop will be ample, and the subsequent produce of clover equally so. Yet their advice to the cultivator is—Avoid fallowing, if you can keep your land clear; but when you fallow, do it effectually, and improve the soil at the *same time*, by the application of lime, marl, &c., as circumstances may enable you to do. In dry weather, spare neither the plough nor harrow. The stitches must, before winter, be laid high and dry, and the water furrows made fair by the spade or some suitable implement. By this process it is asserted that the stiffest land may be brought into a state of high cultivation.

It should be remembered that the climate of Great Britain is essentially different from that of every part of this country; our summers are much warmer, and our atmosphere much drier. Nor do the cold and stiff soils, which compose three-fourths of that island, abound extensively in the United States; though mostly, where prevalent, in the northern part.*

On the whole, it may be set down as a general rule, that summer fallowings are not necessary in this country—certainly not on any smooth, level and dry soil; and in no case where a suitable rotation of crops can be followed.

Fallowing was necessary as long as grains only, all of which exhaust the soil, were cultivated; during the intervals of tilling the fields, a variety of herbs grew in them, which afford food for animals, and the roots of which, when buried in the soil by the plough, furnished a great part of the necessary manure. But at this day, when we have succeeded in establishing the cultivation of a great variety of roots and artificial grasses, the system of naked fallowing can be no longer supported by the shadow of a good reason.

The scarcity of dung occasioned by the limited number of cattle that could formerly be maintained upon a farm, caused the custom of fallowing to be continued; but the ease with which fodder may now be cultivated, furnishes the means of supporting an increased number of animals—those in their turn supply manure and labour—and the farmer is no longer under the necessity of allowing his lands to lie fallow.

Artificial grass lands ought now to be considered as forming the basis of good agriculture. These furnish fodder, the fodder supports cattle, and the cattle furnish manure, labour, and all the means necessary to a thorough system of cultivation.

The suppression of the practice of fallowing, is then equally serviceable to the cultivator, who increases his productions without proportionally increasing his expenses; and to society, which derives from the same extent of soil, a much greater quantity of food, and additional resources for supply.

* Our American farms are from ten to fifteen degrees *south* of the farms of England, yet so keen are our frosts, and so sudden and frequent are the changes from thaw to frost, that common turnips do not stand the winter in our fields. The climate and the soil of America may be believed to differ greatly from those of England.—*Bordley's Husbandry.*

II. LEVELLING GROUND AND REMOVING OBSTRUCTIONS TO TILLAGE.

The most frequent impediments to the common operations of tillage are, swamps, inequalities of the surface, stones, the roots of trees, and the like. The curing or removing of swamps is a branch of draining.* The levelling of ground, and the removal of stones, and similar obstructions, are to be attended to in common operations of tillage.

When the surface of ground is unequal, the plough will suffice for levelling it in common cases of tillage. The plough is made to act in this case by repeated cleavings of the land to be levelled. Frequently, the surface is previously removed by the spade, so that the soil may be replaced upon the new surface after it has been rendered level. In some cases, machines, constructed for the purpose, are employed in the levelling of ground.

III. PARING AND BURNING.

The process of paring and burning, consists in paring off, by means of a spade or plough, the sward or turf of the soil, and burning it either in heaps, or by setting fire to the turfs on edge, and then spreading the ashes upon the surface.

The process must be performed while the weather is sufficiently dry to allow of the combustion of the turf. It may be begun in the month of April, or if the weather be dry and suitable, earlier, and may be continued throughout the summer, as convenience, or the state of the weather, allows.

Burning, especially if it be *judiciously* conducted, completely changes the nature of a soil, and corrects the greater part of its imperfections. Count Chaptal, we believe we can quote no better or higher authority, states, that by these means he gave to agriculture one hundred and twenty acres of land reported sterile, formed almost entirely of a ferruginous and very compact clay. The burning extended to the depth of four inches. Previous to the operation, its sterility was so great, that it was known as the Jew's-heath; but for twelve years immediately succeeding the operation, it produced good, though not very productive crops.

Burning is *hurtful* to calcareous and light lands, to soils of which the composition is perfect, and to fertile lands, rich in decomposed animal and vegetable substances. It is useless

* See article Draining, and also Appendix, letter D.

to soils purely siliceous, for these can receive no modification from the action of fire.

When the soil is in a wild, uncultivated state, and its vegetative powers in a great measure dormant and inactive, they cannot be called into full action without some stimulus. In that case, the ashes produced by sod-burning, with the aid of lime, are generally necessary and always effectual.

When land covered with thick-tufted coarse grass is broken up and sown, the old rubbish carries most of the moisture from the seed, and proves a harbour for grubs, slugs, and other vermin; whereas when the turf is burnt, these enemies to cultivation are destroyed, the causes of sterility are removed, and in its stead a fertilizing power is created, which, without the aid of this process, could not probably have been obtained.

The turf being cut an inch or more in thickness, is set up on edge to dry; and after having remained in this state a sufficient length of time to render it dry enough to burn, it is either set on fire as it stands, or is collected into heaps.

The heaps are set on fire and left to burn, being so covered as that they shall burn with a smothered heat. By this slow combustion the whole heap is equally consumed. The greatest care is necessary in keeping the heap well covered, to prevent the fire bursting out.

But there is often difficulty in getting the heaps to burn, in which case it is necessary to employ straw, light wood, and other substances to maintain the combustion. When the heaps are burned, the ashes are spread upon the surface of the ground, and as quickly as possible covered by a shallow ploughing.

The process of paring and burning cannot be strongly recommended in this country; the cases in which it is advisable rarely exist; and it is difficult to believe, notwithstanding the high English authority by which it is sustained, that paring and burning are good as a regular system. But while injurious where indiscriminately practiced, there is no reason why we should not avail ourselves of so powerful an instrument of improvement when it can be beneficially employed, as it undoubtedly may be under various circumstances.

The cases in which it may be safely used seem to be—1. In the case of poor cold clays, marls, and calcareous soils, when broken up for the *first time.* 2. In the case of swamps, where there is a considerable stratum of peat, and which are broken up for the first time. 3. In the case of deep peaty soils, where there is an excess of undecomposed vegetable fibre.

V.—ON THE ROTATION OF CROPS.

It has been observed by Lord Kames, "that no branch of husbandry requires more sagacity and skill than a proper rotation of crops, so as to keep the ground always in heart, and yet to draw from it the greatest possible profit." Indeed, no one, who understands the subject, can doubt that it is one of the very last importance; and so prominent a place does it hold in the art of agriculture, that no better criterion can be found on which to estimate the merits of a farmer, than in the course of cropping which he has adopted.

More stress has been laid upon a systematic succession of crops than seems requisite. The great art of cultivation consists in the maintenance of the land at least in sound condition, and without impoverishing it, if it cannot be enriched; and it is essentially necessary that the amount of labour, as well as the quantity of manure employed upon the ground, should be duly apportioned to its quality.

The main object of all rotations should therefore be to establish such a *series of crops* as, by preventing the too frequent recurrence of any one of those which are considered exhausting, shall guard against the dissipation or loss of those component parts or qualities of the soil, which seem peculiarly adapted to the growth of each, and in the abundance of which consists its fertility.

A judicious rotation of cropping for every soil, requires a degree of judgment in the farmer, which can only be gathered from observation and experience. The old rotations were calculated to exhaust the soil, and to render it unproductive. To take wheat, barley, and oats in succession, a practice very common not many years ago, was sufficient to impoverish the best land, while it put little into the pockets of the farmer. But the modern rotations are founded on principles which insure a full return from the soil, without lessening its value or deteriorating its condition. Much depends, however, on the manner in which the different processes are executed; for the best arranged rotation may be of no avail, if the processes belonging to it are imperfectly and unseasonably executed.

A good system of cropping is, in my opinion, says the justly celebrated Chaptal, the best guarantee of success that the farmer can have; without this, all is vague, uncertain, and hazardous. In order to establish this good system of cropping, a degree of knowledge is necessary, which unhappily is wanting to the greater part of our practical farmers. I shall here state certain facts and principles, which may serve as guides in this important branch of agriculture.

The proper distribution of crops, and a plan for their succession, are one of the first subjects to which a farmer should direct his attention. The kind of crops to be raised is determined, in a great measure, by the climate, soil and demand; and the quantity of each by the value, demand, and the adjustment of farm labour; the great art of the latter being the division of it as equally as possible throughout the year.

The system of rotation is adapted for every soil, though no particular rotation can be given for any one soil which will answer in all cases, as something depends on climate, and on the kind of produce in greatest request. But wherever the system of rotation is followed, and the several processes of labour which belong to it properly executed, land will rarely get into a foul and exhausted state. The particular crops which enter into a system of rotation, must obviously be such as are suited to the soil and climate, and other local circumstances; such as the proximity of towns and villages, where there is a greater demand for turnips, sugar beet, ruta-baga, mangle-wurtzel, cabbage, potatoes, hay, &c., than in thinly peopled districts.

In general, beans and clover, with rye grass, are interposed between grain crops, on clayey soils; and turnips, the whole family of beets, potatoes, clover, and rye grass, on dry loams or sands. A variety of other plants, such as peas, cabbage, and carrots, occupy a part, though commonly but a small part, of that division of a farm which is allotted to green crops. This order of succession, is called the system of *alternate husbandry;* and on rich soils, or such as have access to abundance of putrescent manure, it is certainly the most productive of all others, both in food for man and for the inferior animals.

One half of a farm is, in this course, always under some of the different species of *cereal gramina,* and the other half under roots, cultivated herbage, or plain fallow. But the greater part of arable land cannot be maintained in a fertile state under this management; and sandy soils, even though highly manured, soon become too incohesive under a course of constant tillage. It therefore becomes necessary to leave that division which carries cultivated herbage, to be pastured for two years, or more, according to the degree of its consistency and fertility; and all the fields of a farm are treated thus in their turn, if they require it. This is called the system of *convertible husbandry,* a regular change being constantly going on from aration to pasturage, and *vice versa.*

The principles upon which a *regular succession of crops is founded*, are thus laid down by Yvart and Pictet of France, and are given in full in "Chaptal's Chemistry, as applied to agriculture," from which work we make our extracts.

Principle 1.—*All plants exhaust the soil.* [Plants are supported by the earth, the juices with which this is impregnated forming their principal aliment. Water serves as the vehicle for conveying these juices into the organs, or presenting them to the suckers of the roots by which they are absorbed; thus the progress of vegetation tends constantly to impoverish the soil, and if the nutritive juices in it be not renewed, it will at length become perfectly barren. A soil well furnished with manure may support several successive crops, but each one will be inferior to the preceding, till the earth is completely exhausted.]

Principle 2.—*That all plants do not exhaust the soil equally.* Plants are nourished by air, water, and the juices contained in the soil; but the different kinds of plants do not require the same kinds of nourishment in equal degrees. —There are some that require to have their roots constantly in water; others are best suited with dry soils; and there are those again, that prosper only in the best and most richly manured land.

The principal part of the nourishment of the grain crops, and the greater part of the grasses which push up long stalks, in which the fibrous principle predominates, is derived from the ground by their roots, so that these plants exhaust the soil without sensibly repairing the loss.

Those plants, on the contrary, that are provided with large, fleshy, porous, green leaves, imbibe from the atmosphere carbonic acid and water, and receive from the earth the other substances by which they are nourished. If these are cut green, the loss of juices, which the soil has sustained by their growth, is less sensibly felt, as a part of it is compensated for by their roots. Nearly all the plants that are cultivated for fodder are of this kind.

Leguminous plants, such as clover, lucerne, beans, peas, &c., exhaust the soil less than the grains. Their perpendicular roots divide the soil, and their large leaves, and thick, loose, porous stalks, readily absorb air and water. Plants that are cut green, or while in flower, exhaust the soil but little.

Principle 3.—*That plants of different kinds do not exhaust the soil in the same manner.* The roots of plants of the same genus or family, grow in the soil in the same manner; they penetrate to a similar depth, and extend to corresponding distances; and exhaust all that portion of the soil with which they come in contact. Plants exhaust only that portion of the soil which comes in contact with their roots; and a spindle root may be able to draw an abundance of nourishment from land, the surface of which has been exhausted by short or creeping roots.

Principle 4.—*That all plants do not restore to the soil the quantity, or the same quality of manure.* The plants that grow upon a soil, exhaust more or less of its nutritive juices, but all return to it some remains, to repair part of its loss. The grains and the oleaginous seeds may be placed at the head of those which exhaust the soil the most, and repair the least the injury done it. In those countries where plants are plucked up, they return nothing to the soil that has nourished them. Many plants that are not allowed to produce seed, exhaust the soil but very little; these are very valuable in forming a system of successive crops, as by introducing them into the rotation, ground may be made to yield for many years without the application of fresh manure; the varieties of trefoil, especially clover and sainfoin, are of this sort.

PRINCIPLE 5.—*That all plants are not equally favourable to the growth of weeds.* It is said that a plant fouls the soil, when it facilitates or permits the growth of weeds, which exhaust the earth, weary the plant, appropriate to themselves a part of its nourishment, and hasten its decay. All plants not provided with an extensive system of large and vigorous leaves, calculated to cover the ground, foul the soil. The grains from their slender stalks rising into the air, and their long narrow leaves, easily admit into their intervals those weeds that grow upon the surface, which being defended from heat and winds grow by favour of the grain they injure.

From the principles here laid down, says our author, we may draw the following conclusions: *First.* That however well prepared a soil may be, it cannot nourish a long succession of crops without becoming exhausted. *Second.* Each harvest impoverishes the soil to a certain extent, depending upon the degrees of nourishment which it restores to the earth. *Third.* The cultivation of spindle roots ought to succeed that of running and superficial roots. *Fourth.* It is necessary to avoid returning too soon to the cultivation of the same, or analogous kinds of vegetables, in the same soil.* *Fifth.* It is very unwise to allow two kinds of plants, which admit of the too ready growth of weeds among them, to be raised in succession. *Sixth.* Those plants that derive their principal support from the soil should not be sown, excepting when the soil is sufficiently provided with manure. *Seventh.* When the soil exhibits symptoms of exhaustion from successive harvests, the cultivation of those plants that restore most to the soil, must be resorted to.

These principles are confirmed by experience; they form the basis of a system of agriculture, rich in its products, but more rich in its economy, by the diminution of the usual quantity of labour and manure. All cultivators ought to be governed by them, but their application must be modified by the nature of soils and climates, and the particular wants of each locality.

To prescribe a series of successive and various harvests, without paying any regard to the difference of soils, would be to commit a great error, and to condemn the system of cropping in the eyes of those agriculturists who are too little enlightened

* In addition to the reasons I have given why plants of the same or analogous kinds should not be cultivated in succession upon the same soil, there is another which I will here assign. M. OLIVER, Member of the French Institute, has described with much care all the insects which devour the neck of the roots of grain; these multiply infinitely if the same or analogous kinds of plants be presented to the soil for several successive years; but perish for want of food whenever plants not suited to be food for their larvæ, are made to succeed the grains. These insects belong to the family of Tipulæ, or that of flies.—(Sixteenth Vol. of the Memoirs of the Royal and Central Agricultural Society of Paris.)

to think of introducing into their grounds the requisite changes. Clover and sainfoin are placed amongst the vegetables that ought to enter into the system of cropping, but these plants require a deep and not too compact a soil, in order that their roots may fix themselves firmly. Flax, hemp, and corn require a good soil, and can be admitted as a crop only upon those lands that are fertile and well prepared.

Light and dry soils cannot bear the same kinds of crop as those that are compact and moist. Each kind of soil, then, requires a particular system of crops, and each farmer ought to establish his own upon a perfect knowledge of the character and properties of the land he cultivates. As in each locality the soil presents shades of difference, more or less marked, according to the exposure, composition, depth of the soil, &c., the proprietor ought so to vary his crops, as to give to each portion of the land the plants for which it is best adapted; and thus establish a particular rotation of crops.

An intelligent farmer, whose lands lie at a distance from a market, will endeavour to avoid the expenses incident to the transportation of his products; and in order to do this he will give the preference to those harvests of fodder or of roots which may be consumed upon the place by his dependents and his animals.

There is another circumstance which must be attended to in sowing those lands which are light, or which lie upon a slope; for these it is necessary to employ such vegetables as cover the soil with their numerous leaves, and unite it in every direction by their roots, thus preserving it from being washed away by rains, and at the same time protecting it from being too much dried by the burning rays of the sun.

In order to support by example the truth of the principles which I have here laid down, I will make a statement of the series of crops that are found most advantageous in those countries where agriculture is the most flourishing. I shall commence with the province of ancient Flanders, because there the art of cultivating the soil to the greatest advantage had its birth. In the departments of Lille and Douai, where the soil is of the best kind, and the art of preparing and employing manures is carried to the greatest perfection, the following series of crops are adopted.

First Series. Flax or cabbage—wheat—beans—oats with trefoil—trefoil—wheat.

Second Series. Turnips—oats or barley with trefoil—trefoil—wheat.

Third Series. Potatoes—wheat—roots, such as the sugar beet, ruta-baga, turnips—wheat—buckwheat—beans—oats and trefoil—trefoil—wheat.*

In this rotation of crops we find that after the soil has been manured, the crops that are most exhausting are replaced by those that are less so; and those that foul the soil, by those that cleanse it by requiring frequent weedings. It is by similar means that nearly the whole sea coast of Belgium, consisting of sterile sand, has been rendered as fertile as the best soil; and the richest harvests have followed from a judicious system of cropping.

This is the *foreign system* of rotation, recommended partly by that great man, Sir Arthur Young, more recently by Chaptal and other eminent agriculturists. By it the industrious inhabitants of many parts of Great Britain and the continent of Europe, have vanquished all obstacles, and fertilized a soil to the highest degree which was heretofore sterile, and nearly unproductive.

The *American system* is conducted on very nearly the same general principles; all that is necessary to say therefore on this point, is embraced in the following paragraphs, which we extract from an interesting paper in the Farmers' Cabinet, page 296, vol. ii.

"*System* is as important in farming as any other business; without it, confusion, disorder and loss will be the inevitable result. Fifty years ago there was no regular, rational systematic rotation of farming pursued in what are now the best cultivated districts of Pennsylvania. The consequence was a regular and constant deterioration of the soil, producing less and less annually, till starvation and want seemed to be inevitable, in many sections of country, that are now in a very high state of cultivation. The introduction of red clover, and plaster of paris, with a judicious rotation of crops, gave rise to the astonishing improvements which have taken place within forty or fifty years. The soil gradually became enriched and regenerated under the improved system, and its increased products enabled its owners still further to add to its fertility; and how far this plan of progressive improvement is capable of being carried, has never yet, that I have ascertained, been determined; but many of us have lived to see farms, that yielded but a very scanty support to a single family, under the old way of cultivation, now not only support in affluence, three, four, or five families, but furnish the means of enriching them all, by the adoption of the modern improvements in agriculture.

"The following rotation is generally adopted by the leading

* The other references are so similar that we omit them.

and most successful farmers in the best cultivated parts of eastern Pennsylvania. After a grass or clover field has been mowed one year, and the next succeeding year been used for pasture, it is broken up or ploughed, either late in the autumn or early in the following spring, and planted with Indian corn, which is cut off in the fall and the field ploughed as before, either in the fall or following spring, and sowed with oats or barley; and immediately after the harvesting of the oats or barley, the ground is ploughed, manured and sown with wheat.

"*Grass seed* should be sowed on the wheat early in the spring, and if timothy is intended to accompany the clover, it had better be sowed in the fall, and the clover, orchard grass, or herd grass seed sowed early in the spring; and be sure not to be too sparing of the grass seed, for much loss is often sustained by not putting it on thick enough, particularly as the clover in some soils is often injured by the winter frosts, and then it is important to have plenty of timothy, orchard grass, or herd grass roots to supply its place.

"The spring following the wheat crop, plaster of paris should be applied, say one bushel to the acre; most of our best farmers consider this to produce as great an effect as any larger quantity. This season cut the grass for hay, and the next succeeding season pasture the grass, and in the autumn it may be again ploughed for corn the following season, and proceed with the same round of crops again in the same order; but if the farm should contain a sufficient number of fields, and the grass be well set, it may be pastured a second year before it is broken up for corn. The first is a five years rotation, the latter six.

"The best time for applying lime or marl in this rotation of crops, is believed to be in the fall, after the wheat crop; applied as a top-dressing on the young grass or clover. In this mode of application, its effects are very conspicuous in the increased quantity of grass the first season, and when the sward is broken up for corn, the effect of the lime or marl, on that crop, will be much greater than if they were applied to it the same season."

VI.—CULTIVATION OF PLANTS.

I. PLANTS CULTIVATED FOR THEIR SEEDS.

I. CEREAL GRASSES.

There are a great variety of plants raised for their seeds, and known as *cereal grasses*. Those most usually grown in this country, to which our climate is friendly, are *wheat, rye, oats*, and to some considerable extent, *barley*. To these we must add *maize*, (Indian corn,) which in many sections is raised in immense quantities, being regarded by the majority of our farmers, probably, as the most important crop they can raise. To this we must add *buckwheat* and *rice*, which are very important crops, the latter not only feeding thousands in this country, but forming one of our principal articles of export.*

The *chemical composition* of plants has been made the subject of numerous experiments within these few years. Some of them have been attended with very interesting results; but as the subject is too extensive to be treated of here, we give the following brief quotation from the works of a gentleman now no more, whose labours in the cause of science have thrown much light on the art of agriculture.†

"The compounds in vegetables really nutritive, are very few; *farina*, or the pure matter of starch, gluten, sugar, vegetable jelly, oil and extract. Of these the most nutritive is gluten, which approaches nearest in its nature to animal matter, and which is the substance that gives to wheat its superiority over every other grain.

"The next in order as to nourishing power is oil, then sugar, then starch, and last of all, gelatinous and extractive matters. Sugar, and farina, and starch, are, however, very similar in composition, and are capable of being converted into each other by a very simple chemical process.

"All the varieties of substances found in plants, are produced from the sap, and the sap of plants is derived from water, or

* The term *corn* is applied indiscriminately in Europe to all grains furnishing food for the human race. Our *maize*, or Indian corn, cannot be successfully raised in England, on account of the humidity of the climate preventing its coming to perfection; and its culture has not, as a field crop, been attended with success in Europe, except in the southern parts, along the Mediterranean, in Spain, the countries of the Levant, &c.

† Sir Humphrey Davy. First Lecture on Agricultural Chemistry.

from the fluids of the soil, and it is attended by, or combined with, principles derived from the atmosphere."

But they are subject to variations however, in quality and proportion, not only in the different kinds of grain, but also in those of the same species: the temperature of the season, the nature of the soil and manure, the degree of maturity which the crop has obtained, and the weather at harvest, all give rise to distinct degrees of quality; and this occasions grain to contain more nutritive properties in some years than others.

Seed of every kind should attain full maturity ere it be sown.—There is always risk in employing that which has not arrived at perfection, although instances may occur in which such seed has produced sound crops, when favoured by soil and season. Several cases of this season's occurrence might be mentioned in illustration of the fact.

There is a particular *period at which each species of seed ought to be sown*, in order to bring the plants to a perfect state of ripeness. This, however, depends so much upon the soil and season, that it cannot be fixed by any general rule; and the farmer can only be governed by the state of the weather and the forwardness of his work; for, whatever may be his experience, his judgment may be deceived in the choice of time.

The condition of the land is, in fact, the best guide; for, if it be in a mellow state, between drought and moisture, the seed may be put in with confidence. Some kinds, however, prefer a dry and warm soil; others, that which is more humid and tenacious. Thus, barley, rye, and buckwheat, succeed best on the former; and wheat and oats on the latter. It has, indeed, been remarked, that a certain state of the atmosphere, with which all farmers are well acquainted, is favourable to sowing.*

The *depth at which seed should be sown*, is a matter of nicety, as well as of importance. If too deeply buried, germination is impeded, and may be altogether prevented; while, if sown too shallow, sufficient moisture is not left in the surface to afford nourishment to the roots of the plant.

The depth at which seed ought to be placed, must, therefore, be regulated by the nature of the soil. If stiff, more moderate covering should be used than if light and porous; wheat, barley and oats, also require more than rye or buckwheat; but, except in a few instances, from one and a half to three inches, is, in every case, the lowest to which it should be carried.

* Library of Useful Knowledge—Farmers' series.

I. WHEAT.

Of *what country wheat is a native,* is, according to LOUDON, totally unknown. It has been supposed indigenous to Asia and Africa; and unquestionably it is more likely to belong to these parts of the world than any other; but all that can be advanced on this subject is conjecture.

Wheat, with the exception of some parts of the southern coast of Africa, (where, according to the declaration of PLINY, it yielded more than an hundred fold,) is cultivated in every part of the temperate and torrid zones, and in some places as high as two thousand feet above the level of the sea.

Species and varieties.—Botanists reckon seven species of Triticum, which are or may be cultivated for their grains, besides many varieties and sub-varieties of those in common culture. The species or sub-species are,

1. Triticum aestivum, summer or spring wheat. 2. Triticum hybernum, neuter or Lammas wheat. 3. Triticum compositum, Egyptian wheat. 4. Triticum turgidum, Turgid wheat. 5. Triticum polonicum, Polish wheat. 6. Triticum spelta, Spelta, Spelt wheat. 7. Triticum monococcum, one grained wheat.

The first, second, fourth and fifth sorts are by many considered as only varieties, and it is doubtful whether the third and sixth may not be the same. The seventh has all the marks of a distinct species, but it is very questionable whether, if much cultivated, it would always continue to produce one row of grains.*

Of the species which have been enumerated, greatly the most important in rural economy is the winter wheat. The kinds of it are very numerous, and, in truth, there is scarce a limit to the differences which climate, soil, and situation may produce.

The characters which it thus acquires in the different conditions in which it is placed, are more or less permanent and important. The kinds are distinguished by a great variety of local terms, derived from their respective qualities, their places of growth, and other circumstances.

With respect to their uses in agriculture, they may be divided into two classes, distinguished by the colour of their *seeds,* red and white; and these may again be distinguished by their *spikelets* being smooth or hairy, the one being termed thin or smooth-chaffed, and the other thick or woolly-chaffed.

Of these classes, the *white* are superior in the quality of their

* Encyclopedia of Agriculture, p. 812.

produce; the *red* are the more hardy; and, in general, the thin and smooth-chaffed are preferred to the woolly and thick-chaffed.

Winter wheat is sometimes termed spring wheat. This merely arises from the period of sowing. If it is sown in spring, it is termed spring wheat; if previous to winter, Lammas or winter wheat. This circumstance has perplexed some writers, who have evidently drawn distinctions between the winter and spring wheat of the farmer which do not exist.

But it is a curious fact that wheat sown in spring, changes its habit with relation to the period of ripening. The produce of wheat sown in spring, acquires the habit of coming much sooner to maturity, than the produce of that sown in autumn. Hence the farmer, when he sows wheat in spring, should sow the produce of that which had been already sown in spring, and not the produce of that which had been sown in autumn.

This change, in the habit of ripening, though it may at first view appear somewhat singular, takes place in all the cereal grasses, and also in many other cultivated plants. The minor varieties of any species of wheat, are not permanent in their character, though under given conditions, they will remain unchanged for an indefinite period. Under other circumstances, however, they degenerate; and hence particular kinds that were once valued, have now ceased to be so.*

Wheat is of very general cultivation on all classes of soils; but the soils best suited to it, are those which are more or less clayey. So peculiarly is wheat suited to the stiffer soils, that they are familiarly termed wheat-soils. The soils of the lighter class are the least suited to wheat; and it is an error in practice to force the production of wheat on soils, and under circumstances, which are better suited to the production of the other grains.

Good wheat land, ought, therefore, always to possess a certain degree of consistence; for, although light soils, composed chiefly of sand and gravel, will often produce wheat of good quality, yet rich heavy loams and strong clays, with a proper portion of sand, always yield that which is the weightiest in the bushel, and the most productive in the crop.

If, along with a small quantity of sand, it have about fifteen per cent. of lime, it may be classed among soils of the best quality for the production of this crop, provided it also contains a sufficient portion of nutritive *humus*, or mould. Soils of this description are generally of a dark brown colour, and work freely, in consequence of the mixture of lime, which prevents them from being too adhesive.

* Professor Low, page 234.

A general rule, applicable to all cases in which wheat is sown, is, that the land shall be in the best condition that circumstances allow, with respect to tillage, cleanness and fertility. As wheat is the most valuable of the cereal grasses, so it requires greater care than the others to produce it. It is an error in practice, to sow with a grain crop, any land which is out of order; but this error is greater and more hurtful in the case of wheat than of almost any other grain crop.

As the wheat crop generally receives no further culture after it is committed to the earth, the soil intended for its reception should be brought into as fine condition as possible. To accomplish this, manuring and thorough culture are indispensable: if this is attended to, the soil will be in a loose, mellow and fertile state, and possessing such a depth of tilth as will have a tendency to preserve it in good condition.

Most crops require high manuring and a rich soil, and it is scarcely possible to carry this to excess, especially in the case of corn: but with wheat the case is otherwise. Land, naturally very rich or very highly manured, is apt to cause during the hot season of summer, a too rapid growth of straw, at the expense of the seed; and rust, lodging, and ultimate failure, is frequently the consequence.*

It is an established law in vegetable economy, that an extraordinary growth of the stem and leaves is always at the expense of the fruit or seed. Hence, fruit trees very rarely bear while in a very thrifty state; but require first to be checked in their growth, in order to produce fruit.

Now, as it is during the heat of summer, a season when vegetation advances most rapidly, that wheat matures its seed, it is more liable, on this account, to suffer from too vigorous a growth, than other plants which ripen their seed later in the season, such as Indian corn.

In modern tillage, wheat more generally follows clover than any other crop; years of practice having confirmed the opinion entertained by many intelligent farmers, that clover is the best preparative for a crop of wheat. The practice is as follows: The clover field having been mowed or fed off, is generally turned up the *second* year of its having been laid down to grass. In this case, all "farmers who *work it right,* give but one ploughing, and harrow in the seed by passing the harrow twice in a place the same way with the furrows."

If the clover sod is completely subverted by the furrow slice being turned *flat,* whereby all the vegetable matter is completely shut in, or buried, the sward thus turned in, will begin to decompose, according to the favourable state of the weather and other circumstances, in from ten to fifteen days. This, by many, is considered as the proper time for putting in the wheat.

* Genesee Farmer, vol. v. page 273.

This process is what is called sowing or putting in wheat *upon a clover ley*, and is considered as one of the great improvements in modern agriculture. It has been adopted for years past in New England, with great advantage. Even in the middle states, in pursuance with this practice, together with the use of plaster and lime, the face of the country in many places has been entirely renovated.

Much diversity of opinion prevails even among many intelligent practical farmers, in regard to the proper period for sowing wheat on a clover ley. Some contending that the operations of ploughing, harrowing and seeding should immediately follow each other: Mr. BORDLEY, in his valuable work on Husbandry, advocates this system. The practice, however, does not generally prevail.

On the other hand, Mr. MACRO, an eminent English farmer, says, "from upwards of twenty years' experience, I am of opinion, that the best way of sowing clover lands with wheat, is to plough the land ten or fourteen days before you sow it, that it may have time to get dry, and after rain to make it dress well. I have often tried both ways on the same lands, and always found that ploughing several days before seeding answered best.

Both modes give crops superior to what are produced on a fallow: farmers may therefore try both methods for determining which to prefer; that is, as well *immediate* sowing on ploughing in the clover, as the method of sowing not till ten or fourteen days after having ploughed in the clover—suppose a half each way.

WEBB HALL, in his Prize Essay on the growth of wheat, says that the ley should be broken up at least a month before the seeding of the ground; both that time should be allowed for the decomposition of the sward, and chiefly, that the land may be allowed to settle.

If it be desirable to sow wheat after a fallow crop of peas, barley, rye, oats, &c., the land should be immediately ploughed or thoroughly harrowed after it is cleared, that the scattered grains may have sufficient time to vegetate—then one good ploughing with sufficient harrowing is a good preparation of the seed.

Seed wheat should be selected from the earliest and most perfect growth of the preceding year, and thoroughly cleansed from rye, cockle, imperfect or shrivelled grains, weeds, extraneous substances, &c. Too much attention cannot be bestowed on this part of the operation, if you wish to harvest a clean crop, as every kind of seed will produce its like. Too much care cannot be observed in the selection of seed.

It has been satisfactorily ascertained by repeated experiments of distinguished agriculturists, that steeping seed wheat about twelve hours in weak ley, lime, or common lime water, will prevent smut, and destroy the larvæ of insects, and the germ of smut and other diseases to which it is subject. If immediately rolled in plaster, or a mixture of lime and plaster, the crop will be sufficiently increased to pay three times the expense.*

This process should never be omitted, because, besides detecting the shrunk and shrivelled grains, and many seeds of other plants, which will float on the surface of the water, it entirely removes the dust of smut and rust, and thus prevents their propagation. This practice is fully sustained by the experience of eminent English farmers, as detailed in the "Farmers' Series of the Library of Useful Knowledge."

A practice of steeping, very general in England, and to some extent practiced in the United States, is thus described by Professor Low. Let a tub be provided, and partly filled with urine, and let a quantity of wheat, as a bushel, be put in at a time. Let the wheat be well stirred, and all the lighter grains which come to the top, be skimmed carefully off, and thrown aside as useless. The wheat should remain from five to ten minutes, but never more than ten minutes, in the pickle.

The successive portions of wheat thus pickled, are to be allowed to drain a little, and then to be laid upon the barn-floor in layers, hot lime being at the same time sifted upon each layer. The purpose of spreading the lime is to dry the grain, which should then be carried immediately to the fields and sown.

The Professor does not mention the quantity of lime. Half a peck must be amply sufficient for a bushel of wheat, and it should be carefully stirred, that every grain may receive a portion. Quick-lime fresh from the kiln, which has been recently slaked with some of the liquor used for the steep, is to be preferred. Great caution is requisite in the use of lime—for if not properly slaked, so great a degree of heat might be raised as to destroy its vegetative power.

A very strong pickle of salt dissolved in water may be used instead of urine; but salt-brine is not quite so secure a means of destroying the infection of the disease as urine. That of urine ought to be preferred as being the most efficient; but it should be neither too *fresh* nor too *stale;* for it is ineffectual in one case, and injurious in the other. Its strength also differs according to the nature of the food from which it is extracted;

* A Practical Farmer, in Genesee Farmer, vol. v. p. 261.

and is more powerful when produced by human beings than by animals. There are many other steeps known to our farmers, some of which are valuable and much used.

We will here repeat, that we wish every grain grower to bear constantly in mind, that wheat, after being pickled, must not remain long unsown, otherwise its vegetative powers may be injured or destroyed. No more should be pickled at a time than can be then sown. When, from any cause, as from rain intervening, it is not practicable to sow the wheat for a day or two, it should be spread thinly upon the floor, but never kept in sacks, in which it would soon ferment.

The wheat, when pickled, then, is to be carried directly to the field. It may be sown either by the hand or the broadcast sowing-machine, in the manner already described, or in rows by the drill machine.

To guard against worms and grubs in the soil, a mixture of slaked lime and ashes, at the rate of from three to eight bushels to the acre, harrowed in at the time of sowing, is the best preventive, and will act at the same time as a valuable manure, if the land has been previously exhausted by too frequent cropping.

The most experienced farmers prefer a *change of seed* to that grown by themselves. In order that they may be enabled to judge correctly of the sample by which they purchase, it should be retained a minute or two in the closed hand, and then passed gently through it to ascertain if the grain be plump, hard, dry, and smooth, with a certain sense of mellow fulness in the feel; for, if it handles rough, and does not slip readily through the fingers, it will be found thick skinned, damp, and unprofitable to the miller.

The time of sowing winter wheat must depend upon the state of the land as well as the season, and it is not always in the farmer's power to choose the moment which he would prefer; for if the wheat be sown after another crop, that crop must first be removed; and even if it be sown upon a fallow, the operations of a late harvest, or the state of the weather, may interfere.

The best period of sowing wheat, it has been said, is from about the middle to the end of September. The early part of October, however, is well suited to the sowing of wheat, and it may be continued until the middle of November. Such is the great diversity of climate and soil in this country, together with the changes of weather and other circumstances, that it is impossible to designate a fixed period, or lay down any general rule—but, on the whole, early sowing is to be recommended.

In regard to the *time*, there is a difference of opinion; many give a preference to early, others to late sowing. By early sowing, the roots of the grain have sufficient time to establish themselves before the frosts of winter set in. It has also been ascertained that grain sown early, will throw up a greater number of lateral stems and branches than that which is sown late. We have also the authority of Mr. Nicholson, author of the Farmer's Assistant, for stating, that late sowing requires one-third more grain to the acre, than if put in early. Early sown, a bushel is sufficient; late, a bushel and a half to the acre, and sometimes more, may be necessary.

Grain for seed should be selected from the cleanest and most thrifty parts of the field; a constant attention to this, will cause a permanent improvement in the kind. By gathering single heads, remarkable for their early maturity, size, &c., and propagating from them, improved varieties may be gradually obtained.

The quantity of seed per acre, varies according to circumstances. It should vary with the time of sowing, and with the size of the grain. Late, requires more than early sowing; and large and full seed should be in greater quantity than that which is small, in order to compensate for the less number contained in a bushel. Much, therefore, must be left to the discretion of the farmer, who must take into consideration the time of sowing, the quality and preparation of the soil, as well as the plumpness or the shrivelled state of the seed wheat.

The proper time for sowing, must not, in any case, be neglected; an error of a few days on this point, will not unfrequently diminish, but in some instances prove ruinous to the crop. But, as a large crop cannot be sowed in a few days, it is better to sow a fortnight too early, than a week too late.

Wheat, and all the cerælia, have the common property of sending out numerous shoots from the roots during their growth. This natural process is termed tillering, and is familiar to all farmers.

It is to be observed, too, that often the roots of the grasses are partially raised above ground, in which case the plant becomes feeble or perishes. This accident sometimes occurs from too thick sowing, and too rapid growth in that state. But it is more frequently produced by the sudden contraction and expansion of the soil by alternate frosts and thaws in winter; and in this case, the wheat is said to be thrown out.

To promote the process of tillering, and sometimes to prevent the throwing out of the plants, it is found to be beneficial to give a certain tillage to the growing wheat in spring, by means of the hoe, the harrow, or the roller. When wheat is sown in rows, this is done by the hoe; when broad-cast, by means of the harrow; and in either case, the roller may be also used.

But this tillage is given to it incidentally, and in the course of another operation to be described, the sowing of the seeds of clovers and the cultivated grasses; a system very prevalent in the grain regions of Europe, and to some considerable extent known to American practice. Like all other systems, it has its advocates and opponents; but so far as we are able to judge from experience and the testimony of others, the mass of evidence is decidedly favourable to the practice.

The seeds of these plants are sown as early as the state of the weather and other circumstances will justify, in the spring, upon the surface of land on which the grain crops have been previously sown. They grow up under the shade of the latter, and in the following season they are fit for use.

When the crops of grain with which they are to be sown, are sown in spring, they are generally put in the ground together. But when the crop, as of wheat, has been sown in the previous autumn, the grass seeds are sown among the growing plants, and covered by being harrowed or rolled.

The minute seeds of these plants, consisting of the clovers and rye-grass, and other grasses, are, previously to being sown, carefully mixed together, sown by the hand, or what is better, by the broad-cast sowing machine. In either case, the harrow follows, giving a double turn along the ridges; and the roller may also follow, crossing the ridges, and going over the ground once. In some cases the roller alone is used to cover the seeds.

The clovers and grasses thus sown, rarely flower in the first year. They grow under shelter of the stems of the larger crops, and they are seen in the autumn among the stubble, covering the surface. They continue to grow, shoot vigorously forth in the spring, and are in their greatest luxuriance in the following summer, when they are frequently termed new or one year's old grass.

The grass seeds being sown, no further culture can be given to the wheat during its growth, nor any weeding, except pulling up or cutting over above ground the larger weeds, such as docks, thistles, cockle, and the like.

Wheat sometimes becomes too luxuriant in the spring, especially when sown early, and then it is apt to be lodged, and run to straw more than to produce grain. In this case it may be pastured in the early part of spring with sheep.

The produce of this crop varies greatly with the seasons, the nature of the soil, the character of the seed, and the mode of cultivation. A fair good crop may be held to be thirty bushels per acre; but the average produce of the United States, will not, probably, exceed twenty bushels per acre. The weight of the straw is reckoned to be about double that of the grain. An acre, therefore, yielding twenty-five bushels of grain, at the rate of sixty pounds per bushel, would yield about three thousand pounds of straw.

The straw of wheat is applied to various purposes of rural economy and the arts. Its intrinsic value must vary, however, according to its feeding properties—the quantity of manure into which it may be converted, when used as a litter—its fitness to be employed as thatch, for which purpose, from its long and rigid stems, it is generally well suitable—or its use in manufactures.* Its price depends upon its vicinity to large towns, where it is wanted for litter.

DISEASES OF WHEAT.

Wheat is subject to various *accidents* and *diseases*, some of them peculiar to itself. The most dreaded and destructive of the diseases to which it is liable, is *blight*, so termed from its effects upon the ear, or *mildew* from its supposed cause, namely, *mel-dew*, from an old opinion that it was produced by honey-dew falling from the air.

In many of the wheat growing sections of the Union, these diseases are denominated *rust* and *smut;* under the term rust, blight and mildew are included. But these diseases, if they are really distinct, are nevertheless so nearly allied, that for all practical purposes they may be considered as one.

It may be assumed as a principle, that the immediate cause of every distemper which attacks the plants of wheat, may be ascribed to the state of the season, combined with the circumstances of soil, situation and seed. It is indeed not necessary to class them; but the great body of farmers consider them as distinct disorders, arising solely from the influence of the atmosphere.

Mildew they regard as a disease which affects the ear, though, in general, it is apparently more injurious to the straw, and is

* The Leghorn manufacture of wheat-straw into the well known Leghorn or Tuscany hats, has lately been inquired into, and detailed in several publications. The variety of wheat cultivated in Tuscany for this purpose is known as the *grano marzuolo*, a variety of summer wheat with long bearded ears. It is cultivated on the sandy hills on both sides of the Arno. The seed is sown in March, very thick, and pulled when the ear is fully shot, but before the grain is formed. It is then eighteen inches high, if the crop is good—it is bleached as we do flax, and afterwards tied up in bundles in the same manner, and carried home, to have the part between the ear and the first fruit [joint?] in the stalk selected, that being the only part used.—*British Gard. Mag.*, vol. v. p. 70.

produced by causes somewhat similar to those which occasion blight, though at a more advanced period of the season. It usually first attacks the leaf, and then the straw, just at the time the grain is blooming; and when it comes on immediately after the first appearance of the ear, the straw will also be affected; but if the grain be fully formed, then it is but slightly discoloured.

There are many causes which probably contribute to the production of this disease, and also to prevent the grain coming to maturity. It is most likely induced by the peculiar state of the atmosphere, during the periods of flowering and ripening; or the absence of some indispensable ingredient in the soil. This opinion appears to be correct, so far as we are yet able to judge of the peculiar cause.

It is doubtless the lack of some necessary ingredient of the soil which prevents the wheat from coming to maturity. It has been suggested by men of science, that lime is a very important ingredient for the growing of wheat. It has also been ascertained by analysis that the lower soil contains double the quantity of lime of the upper soil. When wheat is sown on land exhausted by frequent shoal ploughing, it will produce smut, or the straw will rust, and the kernel blight. I have noticed, and more particularly last summer, that where wheat was sown on land cultivated under the usual practice of shoal ploughing, it was very smutty; and that when it was sown on land where the usual practice was deep ploughing, the wheat was free from smut. If this should be the case on further observation, it would be evident that lime is a great preventive against smut; for by deep ploughing it turns up the lower or sub-soil, which contains the greatest quantity of lime, and gives a greater facility to the growth and brings it to perfection. But when the land is ploughed shoal the lime lies inactive. I have given these hints, that some scientific growers of wheat might make the same observations and give us the result of their research.—Dr. Holmes, *Editor of the Maine Farmer.*

The Rev. Henry Colman, an eminent agriculturist, and a careful observer of all things connected with agriculture, and those branches of science to which it is allied, has furnished the public, through some of the early volumes of the New England Farmer, with a number of able and highly instructive essays on the culture of wheat; and after many experiments, and careful and patient observation, he came to the conclusion, (without, however, assuming to decide the question,) that the disease was "atmospheric—occurring at a particular state of the plant, which rendered it peculiarly liable to blight or mildew."

One experiment detailed by Mr. Colman, and which, no doubt, had considerable weight in bringing him to the conclusion to which he arrived, that the cause was, most probably, *atmospheric*, is too interesting to be passed over. The following is his account, as published at the time.

"Three acres of wheat were sown on some of the best land in the Deerfield, Massachusetts, meadows. The greensward was turned up in the fall, rolled and harrowed; seed well soaked in brine, limed, and sown on the 27th of October, at the rate of two bushels and a half to the acre. One half the field was highly manured—to the remainder no manure was applied. The seed came up finely, and nothing could exceed the beauty and luxuriance of the growth; most of the field averaging more than five feet in height.

"Above half the field, including an equal portion of the manured and that not manured, was passed over twice in the spring, after the grain had got to be six inches in height, with a light harrow, drawn by one yoke of oxen, and three weeks after was subjected to the same process.

"The effect of this was to destroy very few of the plants, and to render the growth of what remained much more luxuriant, producing such an increase of the stem, and such an extension of the heads, as to attract the notice of the most casual observer, and to induce several persons who were ignorant of the process to which it had been subjected, to inquire for the cause of the difference in the two parts of the field, and to ask if a different kind of seed had been used.

"After all, however, to my extreme disappointment, the whole field has been blasted, and I shall hardly get back the amount of the seed sown, and that in a small shrivelled grain. The crop is housed, but will scarcely repay the expense of threshing.

"Now, that this result was not owing to the use of stable dung is obvious, because none was used. In that part of the field where the blight appeared to commence, and to make most rapid progress, no manure whatever was used.

"It was not owing to the want of the *specific property* in the soil, as far as that is to be found in lime and slaughter-house manure, for both of these were employed. The seed was limed, and the above manure copiously applied.

"It is not to be attributed to the *luxuriance* of the crop, for several pieces in the neighbourhood have suffered equally, and from the same cause, where the cultivation was by no means so high.

"It is not a time of universal *failure*. A good deal in this vicinity is perfectly healthy and sound; and I have already reaped on the same farm a small piece of wheat, say half an acre, on higher land, which was healthy and fair, though from the condition of the land it gave but a small product. This, however, though sowed at the same time, was ready for the sickle more than a week sooner than the other, from the drier and poorer quality of the soil.

"As the wheat was filling fast, we had frequent showers, and much of what we Yankees call muggy weather. One day in particular the air was sultry, the heat intense, and the showers frequent, with intervals of sunshine; and the earth was steaming most profusely.

"An intelligent farmer in my employ, accustomed to the cultivation of this grain in one of the best wheat districts of New York, remarked to me that this was very severe weather for my wheat, and that he feared I should lose it. The rust in fact appeared for the first time the next day, and rapidly extended itself over the whole field, presenting no difference either in the manured, and in the parts not manured, and of course less luxuriant.

"Had my wheat been sown *earlier*, so as to have been farther advanced, it would probably have escaped; had it been sown *later*, so as not to have been so far advanced as it was, perhaps I should have been as fortunate. But the occurrence of such a peculiar state of the atmosphere being wholly accidental, at least as far as we are concerned, it is impossible to make any certain calculations about it."

The remedies against rust, mildew or blight, as laid down in the "Code of Agriculture," by Sir John Sinclair, are as follows: Cultivating hardy sorts of wheat—early sowing—raising of early varieties—thick sowing—frequent changes of seed—consolidating the soil—using saline manures—improving the course of crops—extirpating all plants that are receptacles of rust, and by protecting the ears and roots of wheat by rye and other crops.

In the present state of botanical knowledge, as regards the diseases of grain, it is out of our power to offer any remedy for injuries arising from such various and uncertain causes. But as they seem to be chiefly occasioned by a close state of the atmosphere, they may, probably, be partially guarded against, by preserving as free a circulation as possible of air among the plants, by keeping the fences as low as the security of the crop will permit; and especially by drilling the grain instead of sowing it broadcast.*

Smut is a disease almost peculiar to the grain of wheat. It differs from rust and mildew in this, that the means of prevention are generally within our power. The remedies are numerous, and such as are calculated to destroy any noxious quality adhering to the seed grain, be it the seeds of minute parasitic plants or of animalculæ.

An European farmer,† after repeated experiments, gives it as his opinion that the best preventive is to steep the seed in strong lime water, which, it is presumed, destroys the vitality

* British Husbandry, vol. ii. p. 159. † F. Baner.

of the seed of the smut. It is a general opinion, in this country, founded on experience, that the steeping and liming of seed wheat, is a certain remedy against smut.

The use of fresh burnt lime is almost indispensable; as lime, exposed for any length of time to the action of the atmosphere, will, in a great measure, lose its causticity. By absorbing carbonic acid it is restored to the state of limestone or chalk, and its alkaline qualities are completely neutralized.

One of the most eminent of American agriculturists,* whose opinion on these matters is always received as good authority, says, that he is surprised to learn that smut is still permitted to adulterate and diminish our grain crops, when it is a fact amply and satisfactorily established, that steeping the seed grain twelve hours in brine, and rolling it in fresh slaked lime, before sowing, will prevent the evil.

The *pepper-brand* and *dust-brand*, the two species of smut, are parasitic plants, the minute seeds of which attach to the grain, and are propelled through the sap vessels of the plant to the germs of the young grain. The salt and lime destroy the vitality of these seeds.

Of all the injuries to which wheat is liable, there are perhaps none which are more to be dreaded than those arising from *insects* and *worms*, which invariably commit great devastation, and in some seasons spread their ravages to a very alarming extent.

Of these, the various tribes of predatory insects, those known under the names of wheat-fly—hessian-fly—or weevil, or any of their numerous varieties, are the most dangerous; and although treated of by naturalists, they have furnished no means of either a radical prevention or cure. The wheat-fly generally makes its appearance about the middle of June, and its operations, it is asserted by some, cover a period of from thirty-seven to thirty-nine days.

A late American work on Agriculture,† says, that the hessian-fly deposits its eggs in the winter wheat, in which state it remains until the plant has acquired some growth; the grub then feeds upon it, and the plant, having its nourishment intercepted, sickens.

"In the spring it assumes the perfect form, as soon as the weather is moderately warm, and immediately proceeds to deposit its eggs in the wheat.‡ Wheat grown on highly cultivated land is not generally much injured by this fly.

* Jesse Buel, Esq., of Albany, New York, conductor of the Cultivator.

† The Practical Farmer, by an American, New York, 1839, 8vo.

‡ See a very interesting paper on the Wheat Fly by *Observer*, in Farmers' Cabinet, vol. i. page 289, also pages 273 and 306.

No individual probably, has done more to investigate this subject, and find a remedy for the evil, than James Worth, Esq., of Newton, Bucks county, Pennsylvania. The Memoirs of the Pennsylvania Society of Agriculture, for the year 1823, contain several communications, giving in detail the results of his indefatigable and valuable researches.

He recommends a change in the course of crops as the most effectual remedy, viz: break up for wheat, follow with corn, and then oats and grass seed, *ploughing and harrowing the stubble immediately after harvest*, and a SECOND TIME BEFORE MAY, by which means great numbers of insects will be destroyed in the pupa state.

The best remedies seem to consist of a good tilth—a rich but not wet soil—late sowing—ploughing in the stubble immediately after harvest—and perhaps feeding off the crop in the spring with sheep.

There is a case cited in the Memoirs of the Board of Agriculture of New York, in which two bushels of lime were sown upon an acre of wheat infested by the fly, while there was a heavy dew upon the ground. Two adjoining acres, same quality of ground, on which wheat, of the same kind, was sowed at the same time, were not treated with lime. The result was, that the limed wheat gave a good crop, the other not half of an average crop.

Samuel Tallant, of Canterbury, New Hampshire, states, that on the first of July, 1838, a few flies, known as the weevil or grain worm, was discovered on his grain. He examined them from day to day, and found that they increased with such rapidity as to threaten obstruction to his crop. He scattered, by way of experiment, a bushel of slaked lime on about half an acre of the wheat, while it was wet with dew.

The ensuing morning he visited this piece of wheat, and after a careful examination, he found but a solitary fly or worm among it, while in all the other parts of the field, he found the fly had vastly increased in number. He commenced immediately liming the whole field, but his lime falling short, and the case being one admitting of no delay, he had recourse to ashes, which he bountifully applied. The worm or fly disappeared immediately, and the field gave a very fair crop of good sound wheat.

We cannot better conclude our notice of so important an article in agriculture as wheat, than by giving, almost entire, a paper on its cultivation by H. Hickock, Esq., read before the State Agricultural Society of New York.

There are two causes which, when our winters are open, operate injuriously on wheat crops. One is, the high and dry winds which prevail in March;

these blow off the soil in many situations, and, by leaving the roots of wheat exposed, occasion their destruction. Another cause is the heaving of the soil, occasioned by the alternations of cold and warm weather. The water in the soil, in the act of freezing, expands and raises up the earth, and also the roots of the wheat-plants which the earth embraces; when a thaw succeeds, the earth being heaviest, falls down first and leaves the roots of wheat a little elevated, and by repeated changes of the weather, the roots are so far thrown out as to perish.

Farmers, when convenient, usually sow their winter grain early in September, upon a supposition which guides their common practice, that grain thus early sown withstands best the action of unfavourable seasons. This supposition is founded upon the very plausible theory, that, as the oldest roots will be longer and more numerous and take a firmer hold of the soil than those which are younger, they will be the least exposed to be thrown above it, and at the same time, from their greater strength, be more tenacious of life. But experience informs us, that wheat, sown as late as the first or even the second week in October, very often survives with less injury than that which is sown in the early part of September. Indeed farmers very generally admit, as the result of their experience, that rye, who selaws of vegetation must be nearly the same as those of wheat, sown so late in the season as barely to come up, is most likely to withstand an unfavourable winter. Still the very plausible theory which has been mentioned very generally induces them to sow rye early as well as wheat, in direct opposition to conclusions which have been drawn from actual observation.

An experiment was made last autumn for the purpose of collecting some further information on this subject. On the first day of September last I excavated a spot of ground six feet square. On the one side, the excavation was about six inches deep, on the opposite side, its depth did not exceed one inch. Seed wheat was placed over the bottom, so that the kernels were about four inches distant from each other, the excavation was then filled up. The soil was a suitable mixture of gravel, sand and clay, for wheat, and of ordinary fertility. This was the latter part of the extreme drought which prevailed last summer, and the soil was dry, warm and finely pulverized before it was thrown on the wheat. These circumstances, except the extreme dryness of the soil, were highly favourable to the vegetation of seed at the greatest depth in the earth.—On the fourth of the month there was a heavy shower, which not only wet the soil, but beat it down close and hard. On the ninth of the month the plants began to show themselves; but none came up from a greater depth than about three and one-half inches. Two or three days after the second leaf had displayed itself, some of the roots were taken up and examined. It now appeared that nearly an inch below the surface of the ground, a new joint was formed which was the basis of the second leaf, and also of a new system of roots. There were now two tiers of roots; the seed or knot adjoining it, had generated the lower tier, and the new joint the upper one. Those two tiers or systems of roots were connected together by a root resembling a cord or thread, and, in one instance, I cut off this connecting thread and transplanted the upper part. This grew with little apparent check from its curtailment; but the under part died, although the soil above it was opened so as to afford it the advantages of air and solar heat. On the 20th day of September, I examined another plant, which had its two regular formations as expected, and, what was not expected, a blade was discovered about an inch long, which had started from the lower system of roots, and would doubtless have found its way to the surface, had it not been disturbed. It is to be remarked, that this plant sprung from seed placed under cover of nearly four inches of soil, which was about an inch deeper than any of the other plants examined, and that some of the tops of the wheat plants had been eaten off and trodden down by accidental intrusion; a fact unregarded at the time. On the 26th day of September I examined another root, expecting to see the blade from below more perfectly developed, none, however, was discovered; but a third tier of roots was found at the surface of the ground, which proceeded from the second as that had from the first system of roots. On the 16th day of October I placed some seed wheat about two inches in the ground; their delay in coming up induced me to suppose that they had perished from cold and wetness; but at the expiration of three weeks they made their appearance, and although the ground remained open several weeks longer, no second leaf appeared, of course no joint or second system of roots had been formed. The very different formations in the roots of wheat, which this experiment has disclosed, proceeded from causes appropriate and capable of being ascertained, but to distinguish them with certainty, other trials must be made and conducted with greater accuracy than the one of which an account has been given.

From these experiments, though inaccurate, some conclusions may perhaps be drawn of practical use. All plants, which live over winter, possess an apparatus, by which they supply themselves, in autumn, with food for their sustenance in spring.—This food consists mostly of saccharine matter which is enclosed in a proper receptacle. When this receptacle is formed near the surface of the earth, the fermentation of its contents is excited by frequent changes of weather, the saccharine matter is decomposed, and the plant perishes from the want of food, and perhaps also from a rupture of its vessels.

All wheat, shallow sowed, must have its reservoirs of food but slightly covered with soil, and of course they are full exposed.—When wheat is sown early at any depth, a second and, sometimes, at least, a third system of roots is formed within an inch of the surface. In these many stems originate, each of which has its receptacle of nourishment at its base, and it is quite certain that in most instances, the food which was contained in the seed and the adjoining knot is entirely exhausted by the supplies of nourishment it affords the upper portions of the plant. The life of early sowed wheat must then, like that which is shallow sowed, depend upon the preservation of the reservoirs of saccharine matter which are placed at or near the surface of the ground, and of course exposed to the unfavourable action of variable weather during winter.

Wheat, which is late sowed, generates no second blade or new system of roots, and of course the nourishment for spring's use is retained in the receptacle which adjoins the seed. If then we sow sufficiently late in autumn, and place the seed deep in the soil, we shall provide every security against the hazards of bad weather which the nature of the case admits of.

In the ordinary course of husbandry, some of the wheat is necessarily deposited at considerable depth in the soil, and when this takes place sufficiently late in the season, the receptacle of food will be protected by its covering of earth, and a partial crop will often be realized, although there may be, when the spring opens, no signs of life on the surface of the field. In such cases as the destruction of the blade, which issues from the seed-roots in autumn, can be of little importance, one would suppose that the surviving plants would grow the more vigorously, from their being less in number, and, by tillering, produce many stems with large well filled ears; such however is not the fact; usually the stems are single and the heads are not large. To account for this, it must be recollected that, after the ground has thawed in spring, the earth settles and often becomes so extremely hard that doubtless many plants die, in their struggle to overcome the opposing resistance, and the surprise is, that any should possess vigour enough to protrude even a single stem through the hard earth that covers it.

From this view of the subject, the practice may be recommended, of effectually harrowing the field in the spring after the ground has settled, in order to supply the plant with fresh air and give a free passage to its upward growth. After the harrow has been used, the roller ought to be employed to reset such roots as have been displaced and diminish the evaporation of moisture.

In England a wheat plant was taken up, separated into eighteen parts and replanted, and by successive divisions and replantations, a crop of three and one-third pecks of wheat was obtained in less than eighteen months from the time the seed was sown. If the roots of wheat can be so minutely divided and successfully replanted, there is little danger that the freest use of the harrow can be injurious, provided the roller be also used. The fact appears to be, that nothing is necessary to the vernal growth of the plant, but the preservation of the apparatus which contains the saccharine matter which is its proper vernal food; so that if the roots and top be cut off, and the bulb be planted in a genial soil, the plant will grow.

Notwithstanding the arguments which have been urged in favour of sowing wheat late, it must be conceded that, when early sown and our fields are cultivated in the usual manner, it produces the largest crop, if it survive the cold season. Whether such improvements may not be made, as to combine the benefits of a sure and large crop, is a question still open to investigation; the probability is, that both advantages may be secured, by a more correct knowledge of the proper time to sow, and of the best methods of culture.

In the first volume of the Transactions of the Society for the Promotion of Agriculture, Arts and Manufactures, instituted in the state of New York, it is stated that, in Huntington, Suffolk county, fifty-two bushels of wheat had been raised by manure on an acre of land; and Mr. Downs is said to have raised on a poor gravelly dry soil, by the use of fish as a manure, at the rate of 128 bushels of rye an acre. In this case, the rye would doubtless have lodged and been of little value, were it not that it was twice eaten off by his neighbours' sheep which broke into the lot; once when the rye was nine inches high, and again when it was about six inches high.

The production of so large a crop of wheat and of rye must have proceeded from causes which are steady and uniform in their operation, and if all the circumstances which had concurred to produce them, had been distinguished and noted down, similar crops might have been again raised. Some things which occurred during the cultivation of this rye crop, may be ascribed to accident or chance, so far as Mr. Downs' sagacity was concerned, but the causes which proximately occasioned the crop, did not work by accident or by chance, but agreeably to laws or rules from which they never deviate.—This uniformity of operation lays the foundation for making future discoveries, and brings within the grasp of our faculties the knowledge of increasing our crops by methods the least laborious and expensive.

The period may arrive when the farmer shall pursue his methods of culture with an anticipation of the consequences which will result, analogous to that of the mechanician in the construction of a machine, and when, by direct means, he shall procure greater crops than ever were obtained by mere empirical trials.

Time was when the greatest philosophers taught the doctrine, that all things pertaining to the surface of the earth were too irregular and too much under the governance of chance, to admit of scientific inquiry; this error has, within the two last centuries, been dispelled. But a similar error, in regard to rural affairs, is embraced by almost all our practical farmers, and the task of correcting and exposing it, is devolved, it would seem, upon the unaided efforts of a few individuals. Here then is the difficulty.

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2. RYE.

Of the genus Secale.—*There is but one cultivated species.*

According to some, Rye is a *native of the Island of Crete*, but it is very doubtful whether any country can be now ascertained to be its native soil. It has been cultivated from time immemorial, and is considered as coming nearer in its properties to wheat than any other grain.—*Loudon.*

It is more extensively grown than wheat on most parts of the continent of Europe, being a more certain crop, and one which requires much less culture and manure. It is the bread corn of Germany and Russia, Switzerland and Poland, and other countries, and to a considerable extent in the New England states, where it is generally combined with corn meal in the fabrication of bread.

There is but one kind of rye, but this, says the "Farmer's Assistant," may be made either winter rye or spring rye, by gradually habituating it to different times of sowing. Take winter rye, for instance, and sow it later and later each fall, and it may at length be sown in the spring—and then it becomes spring rye. On the contrary, sow spring rye very late in the fall, at first, and you may gradually sow it earlier each succeeding year, until it may even be sown in May, and used the first season for pasture, or mowing, and then grown to perfection the second year.

Rye, with respect to its mode of cultivation, resembles wheat; but it can be grown upon inferior soils, and requires, as before observed, less culture, manure and attention. It is a fit occasion here to observe, that this idea, having taken possession of the minds of many farmers, and being followed out in practice, will satisfactorily account for *light* crops. If good crops of any grain are expected, they should receive proper attention. This should be borne in mind.

Soils of a sandy or gravelly texture are the most natural for rye. Almost every kind of dry soil is more or less suited to its growth. It will produce good crops on poor soils; and prodigious crops of it may be raised on such soils as are suitable and made very rich. Rye raised on upland makes much better flour than that raised on low or damp lands.

Rye may be sown in autumn, or it may be sown in spring, and this circumstance affects the habits of the ripening of the plant. The winter rye is sown in autumn, generally at the same time as wheat; but not later than in all the month of October, except in cases of emergency. The spring rye, with oats, or as early in spring as the weather will allow. Rye shoots into the ear sooner than wheat, and ripens earlier. It stands drought better than wheat, but is more apt to suffer injury from wetness. It is a hardier plant than wheat, and less subject to the attacks of insects and diseases. Some farmers find its culture profitable—more so than other grains.

The seed is generally sown in September, the quantity of seed to the acre varying according to circumstances. Early sown requires less seed to the acre. In Europe from two to three bushels per acre are sown; in this country from thirty-six to forty-eight quarts. It is not customary to steep it, but this precaution can however do no harm, for it is not wholly free from disease; and at all events grain should never be sown, unless it be in a perfect state of soundness and maturity.

Rye usually rises to a greater height than wheat, produces a thinner stem, but a great weight of straw. The straw is hard, wiry, little esteemed for fodder, but is used for thatch and other purposes. It is well suited for the manufacture of straw-hats; and, when intended for this latter purpose, it is sown very thick, pulled green, and bleached by exposure to the air.

Though free from the diseases of wheat, rye is yet subject to a peculiar one. This is the *ergot*, a fungous plant, which, though it is found on other gramineous [like or pertaining to grass, grassy] plants, is, nevertheless, more especially, if not almost exclusively, the peculiar disease of rye.

It is a long cartilaginous-like substance, taking the place of the grain and projecting from the ear. It chiefly prevails in humid seasons, in close situations, or where the soil is wet. Animals when in a state of liberty, refuse it; and when used in quantity among bread, it is said to be highly pernicious.

When sown early, rye is often depastured in autumn by calves, sheep, and even cows, without prejudice to the crop; it is even an advantage. It is often sown as a soiling crop, to be cut in spring, and fed to stock. The quality of the flour is improved by the grain being cut before it becomes perfectly hard.

There is an instance mentioned in the Farmer's Assistant, of a gravelly soil being highly manured and sowed with rye, in which the rye was twice successively eaten off close to the ground by sheep breaking in after it had acquired a height of about nine inches the first time, and six inches the latter. These croppings, however, only served to make it grow thicker and stronger than before; and when harvested it produced at the rate of one hundred and twenty-eight bushels to the acre. The author of the above account supposed that the crop would have been lost by lodging, had it not been for the two successive croppings of the sheep, and suggests the expediency of trying similar experiments with wheat.

It has been remarked that winter rye may be sown early in the spring, and used as pasture during the season; and that it may be sown at the usual time, and serve for a sheep pasture awhile during the next spring without injury to the crop. It may also be mowed for hay two or three times during the summer, when sown in the spring. But in such culture the ground should have much more seed than the usual allowance, which for early sowing in the fall is about a bushel to the acre, or a bushel and a half for later sowing. Spring rye, it is believed, should have this latter allowance, and be sowed as early as the ground can be well prepared.

Rye that is intended for family use, should, if the weather will admit, be harvested even as early as when the rye is yet in the milk, and left to lie on the ground for some days to dry and harden. By such management the grain will make a much whiter flour, though perhaps not quite as heavy as when it stands till it is fully ripe.

When rye is sown successively on the same soil, the stubble should be ploughed under as soon as the crop is taken off, which helps to improve the ground and serves to destroy the seeds of weeds. It should then lay until about the first of September, then sowed, and the seed harrowed in. Some have supposed that in this way the crops will increase in quantity.

3. BARLEY.

Genus Hordeum.

Under the general term of *Barley*, is included all grain that is commonly used for *malting*. This grain has been cultivated from the earliest antiquity; and was much used among the Romans, as food for both soldiers and horses. Loudon says, that it is not known of what country it is a native; some assign it to Tartary, others to Siberia, and even Scotland has been mentioned.

Barley requires a rich soil, rather loamy, but not much inclined to clay. The description of a soil well adapted to the growth of barley, does not differ from that of good corn ground. Soils distinguished for producing good corn, will, under proper cultivation, rarely fail in producing good crops of barley. But, in cultivating the barley crop, good tillage and good culture will always be indispensable.*

The ground should be rich, but not made so by the application of dung at the time of sowing the barley. Ground should always be selected for this crop to which dung was liberally applied the preceding year. Not only must the ground which is intended for the growth of barley be rich, but its tillage must be that of the first order. The barley crop, much less than many others, will suffer itself to be cheated without retaliating the injury.

The following account of the culture,—time and method of harvesting—produce and profits, is from the pen of the late Judge Buel, of Albany, New York.

"*The soil* for barley should be such as will grow good turnips, or other green crops, including clovers, and which embrace the varieties of loams and sands that are not wet, or *very* dry and poor. Indeed, I have taken my crops, and they have been pretty good, from my lightest turnip soils. Barley cannot be cultivated to advantage upon stiff, heavy, and wet grounds, or on such as are of a cold and tenacious quality. This crop occupies the ground but about three months; and it is only in a dry, light, mellow soil that its roots can extend with sufficient facility, and supply the food necessary to bring the grain to rapid and perfect maturity.

"*Previous crop.* Crops that precede this grain should be such as leave the ground mellow and free from weeds; and for this reason hoed crops are to be preferred, such as turnips, potatoes, peas, beans, &c. Small grains should not precede it; they impoverish the soil, leave it foul, and, besides, it is contravening one of the most salutary maxims of husbandry to grow two dry crops in succession. It may follow clover; but if the soil is heavy, the ley should be ploughed in autumn. Barley is successfully sown upon the fallows in England, (not summer, but autumn fallows,) and is sown sometimes after wheat; but in the latter case the turnips are pulled, and previously fed upon the stub-

* Letters from a Father to a Son, in Genesee Farmer.

ble; a practice which I think is not likely to obtain here. I have generally sown barley after ruta-baga or potatoes, these crops having received a good dressing of long yard or stable manure.

"*Manure* should not be applied to the barley, but to the preceding crop. The short period that this grain occupies the ground, does not afford time for the manure to decompose and yield its food to the plants; and, if applied in excess, it causes a too rank vegetation, and the straw lodges before the grain is manured. When a fallow or clover ley is employed and ploughed in autumn, dung may be previously employed and ploughed under.

"*Preparation of the ground.* Where barley follows a root or hoed crop, one ploughing will generally suffice; but in all cases a complete pulverization of the soil is necessary; and to effect this a roller is often of material benefit. If sown upon grass leys, ploughed in autumn, the spring ploughing should be shallow, so as to leave the sod reversed. But the preferable way may be to harrow the fallow, plough in the seed with a light furrow, and smooth off with the harrow.

"*The seed and sowing.* Loudon enumerates six species and sub-species of the barley. The kinds uniformly cultivated here are the two, four, and six rowed spring, (*hordeum vulgare* and *hordeum distichon.*) Thin-skinned, pale, plump seed should be selected. I sow as soon as the ground is sufficiently dry in spring. The young grain is not hurt by the ordinary frosts of the latter part of April and May. I sow from six to eight pecks per acre, according to the richness of the soil and the forwardness of the season; the poorest ground and the latest sowing requiring the most seed. In England, the common quantity of seed is from eight to sixteen pecks. Our climate being much warmer than that of Great Britain, barley and other grains till better with us, and consequently we require less seed. We uniformly sow broadcast, generally on the fresh furrow, and harrow in both ways; and those who have a roller use it in the finishing operation. It gives a smooth surface, breaks down the lumps, brings the earth in contact with the seed, and if grass seeds have been sown, its use is doubly beneficial. I steep my seeds twenty-four hours in a weak solution of nitre, the crude kind of which costs me only eight cents per pound by the quantity. From the analysis and observations of Grisenthwaite, there is reason to believe that this salt is peculiarly beneficial to the barley crop, the grain yielding it on analysis. I have made no comparative experiments, but I think this step serviceable. I have applied to this grain, as a top-dressing, with singular success, the powdered dung of pigeons and dunghill fowls, at the rate of twenty to thirty bushels the acre.

"The crop admits of no after-culture when sown broadcast. Yet the application of the roller, when the plants are two or three inches high, is no doubt salutary, especially if there have been no considerable rains. Rolling gives a salutary compression to the soil, which in the spring is apt to be loose and porous, and full of cracks, by the alternation of freezing and thawing, or of wet and dry weather; it destroys many insects; and, above all, it partially buries the crowns of the plants, and introduces a multiplication of seed stalks. I can recommend the practice from experience. When grass seeds are sown with barley, the luxuriance of the young grass sometimes chokes the grain, robs it of nutriment, and sensibly diminishes the product. To obviate this evil it has been recommended to sow the grass seeds after the barley has come up, and to cover them with a light harrow and a roller; and it is said, and I think with truth, that this operation will not materially injure the grain. In dry seasons, the crop is sometimes attacked by worms, while young. In this case the roller should be applied and sufficient weight added to require the draught of two or three cattle.

"*Time and method of harvesting.* When the soil is rich and the season propitious, this grain is very liable to lodge. If this happens after it has blossomed, no material injury is sustained in the product; if before, the crop is greatly diminished. This shows the danger to be apprehended from making the soil too rich, and of applying fresh manure. Barley is known to be ripe by the disappearance of the reddish cast on the ear, or what the English farmers term *red roan;* by the ears beginning to droop, and bend themselves round against the stems; and by the stalks becoming brittle, and of a yellowish colour.

This is the particular period for cutting, as, if suffered to stand longer, the heads break off, and the grain wastes with the slightest touch. And it may be cut with the cradle, sickle, or scythe, according to circumstances. If it stands straight, and is not too heavy, the cradle is to be preferred; if heavy, or lodged, the sickle or scythe. But as the grain is yet soft, and the straw contains much moisture when it ought to be cut, it should be suffered to become well dried in the swath before it is bound in sheaves, or carried to the barn or stack. If cut with the cradle or sickle, it is bound in sheaves; but the more common practice is to cut the crop with the scythe, rake the ground, and load it with the barley fork.

"Barley improves for malting by lying till October before it is threshed; though it is often threshed immediately from the field. The great difficulty in preparing it for market is to rid it of the awns. This may be done with flails, after it has passed once through the fanning mill; and, where it is in great quantities, it may be spread from four to six inches upon the barn-floor, and trodden with horses.

"*Produce and profits.* The average product in England is stated by Donaldson at thirty-two bushels per acre. The product in New York varies from fifteen to seventy bushels, according to season and soil; and I think the average is somewhat short of that of Great Britain. Compared with wheat, its product is as two or two and a half to one; compared with oats, about equal, provided the soil is adapted to this grain. It is, however, to be remembered, that neither wheat nor oats are adapted to a barley soil; the first requiring a more stiff and tenacious, and the latter a more cold and moist location. The average price of barley is at least two-thirds that of wheat. Supposing wheat, then, to be one dollar and twelve cents the bushel, and the product fifteen bushels per acre, and barley to be seventy-five cents, and the product of an acre thirty bushels, and the expense of cultivation equal, the profits of the barley will be nearly as three to two compared to wheat. Barley, besides, is a less precarious crop, is subject to fewer diseases, and has fewer insect enemies to encounter than wheat.

"A correspondent of the Bath Agricultural Society writes, 'The last spring being remarkably dry, I soaked my seed barley in the black water taken from a reservoir, which constantly receives the draining of my dung heap and stables. As the light grains floated on the top, I skimmed them off, and let the rest stand twenty-four hours. On taking it from the water, I mixed the grain with a sufficient quantity of sifted wood ashes, to make it spread regularly, and sowed three fields with it. The produce was sixty bushels per acre. I sowed some other fields with the same seed dry, but the crop, like those of my neighbours, was very poor, not more than twenty bushels per acre, and mixed with green corn and weeds when harvested. I also sowed some of my seed dry on one ridge in each of my fields, but the produce was very poor, in comparison with the other parts of the field.'"

Barley, on account of the softness of its stem, and tendency of its ears to vegetate, is more apt to be injured, and even destroyed by wet weather, than any other of the cereal grasses. For this reason, the safer course, in a humid climate, is to place it, when cut down, in sheaves and shocks, and not to allow it, as is frequently practiced, to lie loose upon the ground.

Barley being more subject to injury from heating, requires more precaution in the securing of it than any other grain. By heating in the stack it quickly becomes discoloured and injured. It is generally threshed and prepared in the same manner as wheat.

The *straw* of barley is employed partially for fodder, but most chiefly for litter. It is lighter than the straw of oats and wheat, and less esteemed than either.

The *diseases* of barley are not so numerous or fatal as those of wheat. It is attacked by the larvæ of certain flies. It is also subject to smut, though in a partial degree.

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4. OATS.

The oat is of the genus *Avena*. It is the natural inhabitant of cold latitudes; it indeed appears to be indigenous to those latitudes, for it is there found in a wild state as a most troublesome weed, while it degenerates in the warmer parts of the temperate zone, and in lower latitudes disappears from cultivation.

Professor Low enumerates five species: 1. The brittle pointed oat. 2. The short oat. 3. The common oat. 4. Tartarian oat. 5. Naked oat. Of the species that have been mentioned, greatly the most important is the common oat. Of this species there are innumerable sorts, produced by the effects of climate, soil and cultivation. These may be conveniently divided into three classes—the black, the dun or grey, and the white.

Among the numerous sorts grown in this country, is one of recent introduction—the *skinless oat*—from a remote district in China. It possesses the extraordinary advantages of being not only free from husk, but of containing far more farinaceous matter than any of the known kinds; of course it is heavier.

This sort was introduced into England, from whence we derived our supply, in 1830, sown on the 4th of May of that year, and reaped early in August. The produce amounted to twenty-six barrels of fourteen stone each* to the Irish acre. In this country it has produced from thirty to sixty-eight bushels the acre, but it exhibits a tendency to degenerate.

To cultivate oats successfully, good tillage and skilful husbandry are no less necessary than in the culture of other crops. It is an erroneous notion, though entertained by many, that this crop may be cultivated to advantage, on poor soils, without manure, and with slight culture.† The ground ought to be well stirred up, pulverized, and in good condition.

It is universally admitted that oats, to insure a plentiful crop, should be sowed as early in the spring as the weather and the state of the ground will permit. There is no danger, if the ground be in proper order, of sowing them too early. When oats are sown after corn, which is the general practice, the

* A stone is fourteen pounds.

† Genesee Farmer, vol. vi. page 84.

ground should be well ploughed and harrowed before the seed is put in, and afterwards harrowed again to cover it.

Oats require a soil and a climate sufficiently moist. Dry, gravelly, or sandy soils are the most unfit for this grain—and particularly in those localities where drought is apt to prevail during the growth of the crop.

Many farmers seem to act under the impression, that oats, being a hardy crop, will grow well enough without having much done to prepare the ground for their reception. The consequence is, that they obtain only small and unprofitable crops, when, with a trifle more of expense, they might obtain crops of a superior order. If oats are to be cultivated on stiff grass ground, the sward should be turned over, and otherwise managed in all respects precisely as if corn were to be planted.

The *quantity of seed usually sown*, varies with the species, the richness of the soil, the equality of the depth at which the seed is placed, and other circumstances. From one and a half to three bushels are sown—generally from two to two and a half. Two bushels will certainly be sufficient for one acre, if the sowing is performed at the right season, and the ground be in good heart and properly prepared. The greatest care should be observed in the selection of the seed: the heaviest is estimated the best.

Gypsum is a suitable manure for this crop. "It should be applied," says the Farmer's Assistant, "after the crop is harrowed in: as soon as it is harvested, this manure will produce a growth of white-clover, which will be of considerable value for fall-feeding."

In harvesting oats, it is recommended to mow instead of reaping them, as soon as they begin to turn yellow. If then well dryed, the straw is more esteemed for provender than that of wheat, barley, and rye, and is preferred by some animals to the best meadow-hay.

The produce, and consequently the *profit* of oats, varies greatly with the nature of the soil and the mode of management. Thirty bushels are considered the average in England; and in Scotland, where the culture of the oat is more attended to than in any other part of Europe, sixty bushels are held to be a good crop—twenty-five an indifferent or bad one.

Instances are on record, well authenticated, of very large crops being raised in the United States, in some cases exceeding one hundred bushels to the acre. But these are rare occurrences; crops of from fifty to eighty bushels are frequently raised; but the average growth throughout the country will not probably vary far from forty bushels to the acre.

Oats vary in weight from thirty-five to forty-five pounds the bushel. The produce in flour is generally regarded as in the proportion of eight to fourteen. That is, fourteen pounds of grain, (thirty-five pounds to the bushel,) give eight pounds of meal, though the proportional quantity of meal increases as the oats are heavier.

The oat is used almost exclusively in this country as food for animals, especially the horse. In a few places in New England, and perhaps in other sections, after being kiln dried, hulled very clean, ground and bolted, it makes a fine flour, which, mixed in equal proportions with wheat flour, will make a bread so white and fine, that even the best judges cannot distinguish it from bread made entire from the best of wheat flour.*

A large portion of the oat meal, sold in the shops by druggists, is manufactured and prepared in this country; it is equal in all respects to the imported; and no necessity whatever exists, for sending thousands of dollars annually out of the country, as has heretofore been the case, for articles which we can raise at home.

Oats are subject to considerable hazard of injury by the shaking of winds, as the grain approaches to its ripened state. In the early stages of its growth, it is subject to the attacks of several enemies, of which the principal is the wire-worm, which is the larvæ of a very small beetle—*Elater segetis;* and by the larvæ of several other insects, comprehended by farmers under the general name of grub.

The *diseases* of the oat are not numerous. Sometimes it is found attacked by the smut. An effectual remedy is said to be to work the seed thoroughly in strong lime-water, letting it remain in soak during the night previous to sowing: a sprinkle of plaster on the seed, would probably prove beneficial.

5. MILLET.

Under the term millet, says Professor Low, are comprehended certain plants of different genera, which are cultivated for their seed. 1. Common millet. 2. Italian letaria. 3. German setaria. 4. Indian millet. In Latin it is called "MILLIUM," *as if one stalk bore a thousand seeds.* This plant is a native of India; whence its cultivation has gradually spread over northern Europe. Its stalks and leaves resemble those of Indian corn, though much smaller. Its cultivation in England, except as a garden plant, was unknown until after the commencement of the present century.

* See Appendix, E.

In Russia, Germany, Hungary, Italy, and other parts of Europe, common millet is used in the manner of rice, and furnishes a nourishing and grateful food, the seed being previously divested of their outer covering. It is rarely made into bread.

The Indian millet furnishes bread to the Arabians and other people of the east. The Arabs call the flour *dourrà;* and it is truly the bread corn of Africa, being grown over all the parts of that vast continent. It was long ago introduced into Spain, it may be supposed by the Moors, if not at an earlier period still by the Carthagenians. It has been introduced also into the islands of the West Indies, and some parts of South America, where it is known under the name of Guinea corn.

Millet may be sown in the middle states from the 15th of May, until the 20th of July, and will generally produce a heavy crop of hay in six weeks, yielding at the rate of from two to four tons to the acre. If designed for *hay* alone, it should be cut as soon as the head is formed. It cures easily in cocks, keeps well, is very nutritious, and is eaten with avidity by horses and cattle.

If the object is to obtain the *seed,* which makes an excellent food for fattening swine, poultry, &c., let it remain a few days longer until the head turns yellow. Then cut, thresh out the seed when dried, and put away the hay. When the seed is permitted to ripen, the hay, of course, is harsher, but it is still a highly nutritious provender for stock of all kinds.

The soil for millet should be warm, light or sandy, rich, and well pulverized to a good depth. If for hay only, three pecks to a bushel of the seed to the acre is sufficient; but if for both grain and hay, four pecks will answer: it should be sown thin and not deeply covered. "When cultivated in drills, three feet apart, and six inches in the rows, it has produced as heavy crops per acre as Indian corn, but owing to the difficulty of saving the crop, on account of birds, its ripening unequally, and its shelling out, it is generally sown broad-cast." The plant, as well as its growth, is greatly accelerated by stirring the soil, after which it grows astonishingly fast and smothers all weeds.*

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6. *MAIZE*, OR INDIAN CORN—*ZÈA MÀIS.*

The maize is not only one of the most noble looking of the cereal grasses, but it is one of the most valuable, second to wheat only; and indeed in many places, taking even the

* Professor Von Thaer.

precedence of wheat itself.* Some late writers are of opinion, that the native country of the Indian corn is still undetermined.

That it is a native of this country, and has been extensively cultivated in North and South America, from time immemorial, we can entertain no doubt. This subject has been fully and ably discussed, in an "Essay on Indian Corn,"† in which it is shewn most satisfactorily, that it is a native of America.

Indian corn has a wide range of temperature. In America it flourishes from about the 40° of *southern* to beyond the 45° of *northern* latitude. It is extensively produced in Africa, Asia, and the south of Europe. On all the shores of the Mediterranean—Spain, Italy, and the countries of the Levant—it supplies the food in most common use. The Edinburg Quarterly Journal, says, that of all the cerealia, indeed, it is that which, next to the rice, supplies food to the greatest number of the human race—and it may be held to be the most valuable gift of the new world to the old.

Corn, either in whole or in part, is used for bread by one-half if not by two-thirds of the inhabitants of the United States. In the south the climate is unfavourable to the preservation of wheat and flour; hence corn is of necessity a principal article of subsistence with them; while in New England, mixed with rye, it is preferred to any thing else for bread.‡

The cultivation of corn must then be an object of primary importance with every farmer; and the best methods which experience or theory suggest to increase the quantity and value of the crop, should be attended to by every one engaged in its production.

Wheat does not grow on the plains under the equator; it flourishes only in regions that are temperate; while corn delights in the brightest summer sun, and never suffers from the most intense heat, if its roots can only be supplied with moisture. It requires a good soil—one is rarely if ever found too rich, either naturally or artificially. It bears manure better than any vegetable known among us—requires deep ploughing, and sends out its roots to a very great distance and depth.

For this reason, in a rotation of crops, corn generally forms the first of the series, being, like some of the cultivated roots, a gross feeder, and unlike some of the other grains, the magnitude and plumpness of the ear, usually correspond with the

* It is generally ranked as the third grain in point of utility, by European writers, they placing it before rice and wheat; but in the United States *it takes the precedence of all other grains.—Essay on Indian Corn by* Peter A. Browne, Esq.

† An Essay on Indian Corn, delivered by Peter A. Browne, Esq., LL. D., before the Cabinet of Natural Sciences of Chester county, Pennsylvania.

‡ Genesee Farmer, vol. vi. page 161.

size and vigour of the plants produced. Corn land must be made mellow, and if free from weeds and grass, so much the better for both the corn and the cultivator.

Soil. Corn requires a rich, loose and friable soil; and unlike those distinguished for wheat. Yet corn and wheat not unfrequently grow well on the same ground; but there are soils which are excellent for wheat on which corn cannot be grown to advantage. On stiff clayey soils, it is never wise or safe to undertake the culture of corn.

In general, the best soils for corn are such as contain in their composition a large proportion of sand. A light sandy loam is highly esteemed. It has been said that corn requires a rich soil—of course it should receive plentiful supplies of manure. It may be planted after almost any other crop. Wheat stubble, or an oat or rye stubble, is a good preparation for corn; but there is no preparation more suitable for it than a greensward; and if the soil has become old and stiff, that circumstance, of itself, is no serious objection to it.*

Preparation. As the practice of planting corn on greensward, has become very general, and is considered as a highly important improvement in husbandry, a few remarks, in reference to the manner or mode of preparing the ground for the crop, adopted by many of our most intelligent and successful farmers, may not be deemed out of place.

The author of "Letters from a Father," who ranks among the first farmers of the Union for his practical knowledge of agriculture, has tried this method for years past with manifest benefit. He says, "a few days before the planting season arrives, the greensward, having had a plentiful supply of dung spread upon it, should be turned over, and the work performed in a masterly manner.† I say *masterly manner*, meaning to use the phrase emphatically. What I mean is, that the work should be performed in a very careful and skilful manner.

"Every particle of the sod should be broken up and turned over in furrows, dropping either flat down, or inclining a little one upon another.‡ Frequently, while the plough is perform-

* Letters from a Father living in the state of New York, to his son in Western Pennsylvania. Vol. vi. Genesee Farmer.

† We would recommend in addition to a liberal application of unfermented manure, a light covering of lime to promote the decomposition of the tap and lateral roots of the grass. The lime, if but five bushels, should be applied before the manure; the result will, in almost every instance, be highly advantageous. Some cultivators prefer manuring the sward in the fall, ploughing it in, and after harrowing, let it remain until spring.

‡ We cannot agree with the writer in the propriety of the furrows "inclining a little one upon another." There is no danger in laying the furrow too flat. It is certainly the best way. See article Ploughing.

ing this work, it will be profitable to have a hand follow, whose business it should be to rectify places in which the work is imperfectly performed. Such should be the tillage of greensward when corn is to be planted upon it.

"But why speak of such tillage as though it were applicable to corn ground alone? In no other manner should greensward ever be broken up, whatever may be the immediate use for which it is intended. If farmers, when they commence their summer fallows, would plough in the manner now suggested, instead of cutting and covering and leaving the clods in all positions, as many of them do, their gains would be very great."

After the plough comes the *roller*. It is by no means a matter of indifference whether the ground be or be not rolled. The roller is of great use in settling down the turf, and thus placing it in a situation the more readily to rot, and administer nutriment to the crop. The roller as well as the harrow, should be drawn only in the direction of the furrows, *not* across them. But if the use of the roller is forbidden by the presence of too many stumps or stones, then the tillage must be completed as well as it can be by the harrow only. But it must be remembered that rolling in no case supersedes the use of the harrow.

The last implement employed in the tillage of the ground, preparatory to planting, is the *harrow*. It should not be used sparingly, but carried over the ground until the entire face or surface of the inverted sward is completely broken up and thoroughly pulverized. The full benefit of the harrow in such cases, is rarely realised, as it is seldom used as much as it should be. After the sward has been thus prepared, it should in no case whatever be subsequently operated on, or stirred up so deeply as to disturb the sod. In subsequent tillage, the cultivator may be used to great advantage—the operations of whatever kind should be superficial.*

Manure. "Unfermented stable and yard manure is decidedly preferable if spread broadcast, as it always should be, and thoroughly buried with the plough. It keeps the soil open, and permeable to heat, air and moisture, the agents of nutrition; it imparts warmth to the soil while undergoing the process of fermentation, and affords the best food for the crop."†

Edward Tatnall, of Brandywine, Delaware, has furnished the public with some interesting statements relative to his method of growing corn. He says, speaking of the manure, "it is best to combine the lime and manure by applying both

* Cultivator, vol. iii. p. 21. † Ibid.

to the same crop. That is, in preparing for a crop of corn, I should put on about twenty-five ox-cart loads of barn-yard manure to the acre, spread it evenly, and plough *late* in the fall, harrowing it well before winter sets in.

"In the spring I spread on sixty bushels of lime to the acre, again harrowing until the ground is in good order for planting." It is then struck out lightly, in which operation, as well as in the after culture, the greatest care is taken not to disturb either the sward or the manure.

By this process the land is left in good order for the following crop; and we learn from Mr. Tatnall, that he has raised from sixty to seventy bushels of corn per acre the first year, and from twenty-five to thirty bushels of wheat following the corn crop; and that, too, from land that would not previously produce oats worth cutting. Several farmers of our acquaintance have adopted Mr. T.'s plan, successfully, so far as the corn is concerned—and no doubt is entertained of the value of subsequent crops.

Selection of seed. The *Dutton corn,* so called, is the earliest for field culture that we are acquainted with, and most suitable for the middle states. It may be planted in this latitude, 42°, the latter part of May, and even as late as the first of June, and cut off the first week in September fully ripe. It is a hard corn, deeply yellow, grains set very close, generally twelve rows, sometimes more, but never eight. It is remarkably heavy, and is considered more sweet and nutritious than the ordinary kinds of corn usually raised in this country. The stalk is small, it shades the ground less than other kinds, and of course admits of being planted much nearer together. Many of our farmers, however, still prefer the old varieties of gourd seed.

The Canada or Northern corn is cultivated extensively in some parts; while in the southern and south-western states the *Baden corn* is in high repute, and has taken the precedence of almost every other kind. It is very prolific, stalk large and vigorous, and requiring a long season to come to maturity. It appears to be peculiarly adapted to the south; and although it has been raised in the middle and northern states, and in many localities would be highly desirable on account of its great yield, and the vast amount of fodder it affords, yet our liability to early and severe frosts forbid its general cultivation.

Preparation of the seed. The following is Judge Buel's practice in preparing the seed for planting: "We turn upon the seed, the evening before planting, water nearly in a boiling state. This thoroughly saturates the seed, induces an incipient germination, and causes the corn to sprout quick. The next morning we take half a pint of tar, for half a bushel of seed, put it into an iron vessel with water, and heat it until the tar is dissolved and the liquid becomes tar water. It is then turned upon the seed and well stirred. It adheres to the grain and gives it a thin transparent coating.

The tar serves a double purpose—it prevents an excess of moisture entering and rotting the seed if the weather or soil are cold or wet; and it preserves it from the depredations of birds, (and some insects,) &c., which prey upon it. After the seed is taken from the steep, where we never leave it more than fifteen hours, as much ground gypsum is mixed with it as will adhere to the kernels. The gypsum prevents the kernels adhering to each other, and favours the after growth of the crop." Ashes or lime may be substituted for gypsum. The seed should be planted while it is moist, and immediately covered. It should not be long exposed to the sun.

Distance in planting. The varieties of seed and the richness of the soil must determine the distance at which the corn should be planted. If the distances are too great, there is a needless waste in the use of land; if too small, the corn will be choked and rendered less productive. When it is considered that good varieties and proper distances are attended with no additional expense or labour, its importance must be manifest. The northern varieties of corn are much better adapted to the culture of the middle states than the southern varieties already referred to, though the latter are very productive.

The Dutton, and other northern varieties, being much smaller in the stalk, require less room than the southern, and, consequently, a much larger number of hills or rows may be planted on an acre; and in the same proportion is the crop increased. The most approved method now adopted of planting corn, is in *rows* or drills, generally running north and south; the respective distances between the drills, and the seeds deposited in the drills, must vary according to circumstances.

It has been stated, and that correctly, that nearly all the large premium crops of corn, which have been noted in the annals of agriculture, were procured by planting the corn in drills, either single, double, or treble. A difference, however, exists relative to planting it in ridges, or on a flat surface; this must, in a great measure, depend upon the nature of the soil; as a loamy soil, or one suitable for corn, ought in this climate to be cultivated in a flat way, in order that it may the better retain moisture.*

Quantity of seed and covering. "From using too little seed, and a recklessness in covering it, many corn fields are deficient one half of what ought to grow upon them." From six to eight kernels are to be dropped in a hill, and very carefully covered with finely pulverized mould. If any hard clod or substance is placed on the hill, the plants will probably be retarded in their growth. Care must be taken that the seed be not buried too deep, as it may not germinate—if too shallow, it may suffer for the lack of moisture. The extra expense for additional seed

* Complete Farmer, p. 34.

and labour is nothing, compared to the increase of the crop. Two inches is a sufficient covering, if the earth is so compressed as to retain its moisture.

The after culture. As to the after culture of the corn crop, it is almost impossible to prescribe any thing like a rule of universal application. The great object is to extirpate weeds, and to keep the *surface* mellow and open, that the heat, air, and moisture may exert the better their kind influences upon the vegetable matter in the soil, and converting it into nutriment for the crop. The cultivator may be advantageously passed between the rows of corn three or four times, though ordinarily but two dressings are given to the crop. This practice is to be governed altogether by the state of the soil and season.*

The plants are thinned at the first dressing, which is usually performed with the hand-hoe—the surface pulverized, and the plants reduced to from three to four in a hill. It is well to gather, at this operation, a little fresh earth into and around the hill. A somewhat similar process is observed by many in the second dressing. The earthing must not exceed one inch and a half, that the hill be broad and flat, and that the earth for this purpose be not taken from one place, but gathered from the surface between the rows, where it has been loosened by the cultivator.

Harvesting. The crop should be cut up at the ground as soon as the grain is glazed, or as soon as it will do to top, and, without being laid on the ground, set immediately in stooks. There are four substantial reasons for adopting this mode of harvesting. It secures the crop from the destructive effects of frost; it quadruples the value of the fodder; it clears the ground early for a fall crop, and it saves labour in harvesting; and, we may add a fifth, it makes a better crop of grain, under any contingency, than when it is topped in the old way. We are confident of this last fact. The grain continues to profit by the elaborated sap in the cut stalks, while it does not profit by the unelaborated sap, below the ear, in the topped corn.

Husking and cribbing. The ears should be gathered from the stalks, and the latter stacked, as soon as they have become sufficiently dry and cured, as unnecessary exposure to the weather is prejudicial to both the grain and the forage. From two to three weeks generally suffices to effect these objects. The corn may be picked off and carried to the barn, and it should be husked within twenty-four or thirty-six hours thereafter, and before the least heat is perceptible in the pile, and the stalks bound and placed in small stacks, so as to expose all the butts, which have become saturated with moisture by standing on the ground, to the drying influence of the sun and winds—and the stacks topped, or covered with straw, so as to shed rain. After a fortnight or so, they may be carried, in a dry state, to the barn. When picking the corn from the stalks, the best seed ears should be selected, and immediately braided, and hung in an airy loft. The corn should be exposed, after being husked, upon the barn floor, to the drying influence of the winds, and it may require to be turned over and stirred, till the *cob* is thoroughly dried. If this is wet, when cribbed, fermentation may ensue, or a frost may follow, sufficient to congeal the moisture in the cob, either of which will impair the quality of the grain, and destroy its germinating principle.

In sorting the corn we make three parcels, viz. sound grain for the crib, pig

* E. P. Roberts. J. Buel.

corn, embracing the ripened but defective ears, and the truly soft and smutty ears, which are not husked, but thrown by for immediate use. The silk and husks are carefully separated from the two first parcels, as they imbibe moisture, induce mouldiness, and afford building materials for mice. We also separate the grainless tips and stems of that which we place in cribs, for the like reasons, and to preserve the grain in a sound bright condition.

The forage from the corn crop, when saved in the manner we have directed, is an excellent fodder for neat cattle, if cut for feeding out. We have used it in this way, exclusive of hay, for two years, and find it answers all the purposes of hay. Our practice is to cut a quantity, to mix with it bran, or roots, cut up, when we have them, and to sprinkle the mass with brine, and to feed in mangers.

The Genesee Farmer, vol. vi., contains an article of great interest to corn growers, presenting, in a condensed form, a history of the various methods adopted by farmers in different sections of the United States to produce those large crops, which go so far to show that the capabilities of our soil, and the most beneficial and advantageous course of treatment, are but imperfectly understood.

"Too many concurring favourable circumstances are, perhaps, required to often realize the highest hopes of corn, on record. If the best and most thorough modes of preparation and culture were adopted, yields of from eighty to a hundred bushels might, in favourable seasons, be relied on with certainty." Indeed it is not uncommon, in many parts of our own state, (Pennsylvania,) to witness a yield of from seventy-five and eighty, to a hundred bushels of corn upon an acre, without any extraordinary application of manure, or unusual attention to the culture—certainly not more than all crops should receive. These results were, of course, in seasons favourable to the growth of corn. E. P******E, of Delaware county, has averaged from ninety to one hundred bushels per acre, for several years in succession; and he informed the writer of this, that in the year 1838, a season of drought, his corn turned out ninety-seven bushels per acre—this he attributed mainly to the fact of his keeping the earth well stirred during the prevalence of the drought.

Mr. Gaylord, in the article referred to above, in which he proceeds to show the method adopted to produce large crops, says: The first I shall give, is from a report of a crop by Mr. Bugbee, near Springfield, Massachusetts. He says, "Last spring I ploughed up a piece of greensward, measuring five acres. After ploughing, thirty loads of manure to the acre were spread over it, and thoroughly mixed with the earth by the harrow, without disturbing or breaking the sward. On the 30th of May I planted my corn. A small quantity of ashes, lime and plaster, mixed together and prepared for the purpose, was put into the hill at the time of planting. Of this mixture there were two and a half bushels of lime, the same of plaster, and twenty-five bushels of ashes for the whole five acres." The corn was hoed twice, and from one acre, the crop being carefully gathered and measured, it was found to be one hundred and eight bushels of good clean merchantable corn. As this acre was no more than a fair average, the quantity produced by the five acres was not less than five hundred and forty bushels. How much in this case is to be attributed to the mixture applied to the hill is of course unknown, but the theory of the application is good, and deserves a repetition.

We give another extract from the Ploughboy, of December, 1820. "There was raised on the farm of R. H. Rose, at Silver Lake, Pennsylvania, the present year, Indian corn at the rate of one hundred and thirty-six bushels per acre. It was the short white eight rowed corn, planted in rows three feet apart—the stalks nine inches from each other in the rows. Rather before the usual time of topping, the stalks of every other row were cut off just above the highest ear. The corn was planted on the third day of June, and gathered on the sixteenth day of September." A writer in the Genesee Farmer, vol. i. No. 20, seems to have mistaken the object of thus cutting every other row. He says, "In order to take advantage of this operation, (of topping,) the stalks should be cut as soon as they are up, and before the blossoms appear, because after the blossoms have shed their pollen, then their functions are performed, and all the stalks might be taken off as well as half." The object of topping every other row was undoubtedly to give the plants more benefit from the sun's heat; but we doubt whether in this, or any other method of topping, the loss is not greater than the gain. The sap must be elaborated in the leaves, or it does not become fit food for plants; of course topping must be prejudicial.

In 1831, Mr. Butler, of Chenango county in this state, reported for the New England Farmer a crop of corn raised by him that year, and the method of cultivation. The ground was a stiff loam. The land ploughed but once, yet thoroughly and completely done. Twenty-five cart loads of sheep manure was then put on an acre, and spread evenly over the surface. It was then rolled and harrowed with a light double harrow containing forty teeth, until it was a complete garden mould. The land was planted on the 22nd and 23d of May, on an even surface, with the early, small white flint corn, steeped in a solution of copperas and saltpetre, and then tarred and rolled in plaster, and planted three and a half feet from centre to centre of the middle of the drills. The plants stood singly from twelve to thirteen inches on the drills. The corn was kept clean, plastered well on the plant, topped at the usual time, was ripe on the 15th of September, and was harvested the middle of October, and found to yield "at least one hundred and thirty bushels of shelled corn, sixty pounds to the bushel, or one hundred and forty bushels, at fifty-six pounds per bushel, to the acre.

But the greatest crop of corn, we have reason to believe, ever raised in this country, was that reported by the Messrs. Pratts of Madison county, and which was well authenticated in every respect, amounted to one hundred and seventy bushels per acre. Their mode of preparation for planting does not appear to be superior to those mentioned above, but they increased their crop by adopting a system of planting which gave a greater number of stalks, and of course ears.

It is admitted that these are extraordinary cases of productiveness; but the ordinary crops of Mr. Stimson of Galway, and Judge Buel of Albany, averaging as they do from eighty to one hundred bushels per acre, clearly demonstrate what may be accomplished by sound theory and corresponding practice. We think that farmers in general are not sufficiently aware how much the amount of the crop depends on the method of planting. This is an operation which more than most others requires attention and system; for let the soil be ever so rich and productive, if there is not half the seed put on which the land can support, or if it is not properly distributed, there will of course be a deficiency in the crop. To show how much greater the number of stalks will be in one method than in another, we have prepared an estimate collected in part from an address by Judge Buel, and the statement of Mr. Clark of Northampton. In a favourable soil it rarely happens that every original stalk does not produce one ear, and sometimes two, of corn; allowing these ears to produce in shelled corn one gill each, and they must be very inferior not to exceed that quantity, the amount produced per acre by different methods of planting, will be as follows, four stalks being allowed to each hill when planted in that form.

An acre in hills four feet apart, and four stalks in a hill, will have two thousand seven hundred and twenty-two hills, or ten thousand eight hundred and eighty-eight stalks. An acre planted three feet apart will have four thousand eight hundred and forty hills, or nineteen thousand three hundred and sixty stalks. An acre planted three by two and a half feet will have five thousand eight hundred and eight hills, or twenty-three thousand two hundred and thirty-two stalks. An acre planted in drills at three feet, and the plants in the rows at six inches distance, would have twenty-nine thousand and forty stalks. An acre planted in double drills,

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six inches apart, the plants nine inches in the rows, and three feet nine inches from the centre of the drills, would have thirty thousand nine hundred and seventy stalks. An acre planted three rows in a drill, thus,

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rows six inches apart, and the plants nine inches in the rows, with a distance of three feet from the centre of the drills—and this was the way adopted by the Messrs. PRATTS to produce their great crop—would have forty-three thousand five hundred and sixty stalks. Reduced to a tabular form, and a gill of corn to a stalk allowed, and the result would be thus:

Rows 4 feet by 4,	10,888 stalks,	42 bushels,	fractions	omitted.
" 3 " 3,	19,360 "	75	"	"
" 3 " 2½,	23,232 "	93	"	"
Drills 3 feet, plants 6 inches,	29,040 "	113	"	"
Double drills as above,	30,970 "	120	"	"
Triple drills as above,	43,560 "	170	"	"

The difference is indeed most striking, yet how few there are that will profit by such lessons. We continue to plant our corn so as to get only from forty-five to fifty bushels an acre, when the same soil is able to give us eighty or a hundred. But we satisfy ourselves with the reflection, that our fathers were as wise as most men, and they always planted their corn in hills, and why should we deviate from such a practice. The best corn we have ever raised, or seen raised, was planted in rows two and a half feet apart, and the corn eighteen inches in the rows, two stalks standing together, being the same as if planted in hills at three by two and a half feet.

There can be no possible doubt of another thing in planting, and that is, our farmers are far too economical of their seed corn. Better to use double the seed actually required, than to have your land but half supplied with plants. There is an advantage too in being able to select the most vigorous plants at hoeing, while the weak and sickly ones, not being needed to stock the field, can at once be rejected. Judge BUEL has estimated the expense of raising a crop of corn at fifteen dollars per acre, allowing five dollars for rent of land. Now, if a farmer gets, allowing the corn worth fifty cents per bushel, sixty bushels, he makes fifteen dollars an acre; if but twenty bushels, he loses five dollars; making a difference in the profits of twenty dollars between twenty and sixty bushels an acre, or one hundred dollars on a piece of five acres. Corn, when properly cultivated, is a most valuable crop, and when, as for several years past it has, commanded seventy-five cents a bushel, it is a very profitable one. It ought, moreover, to be remembered, that the extra manuring and tilling required to produce a heavy crop of corn, is abundantly repaid in the increased quantities of wheat, barley, or grass that may follow. Twenty acres of good land is better than fifty of poor; and a man will be much more likely to get forty bushels of wheat, or fifty of barley, from land that has produced a hundred bushels of corn to the acre, than from that which will not produce one-fifth that amount. It is contrary to the order of nature, that manure and labour applied to the earth should be lost.

7. RICE.

Rice has been known and cultivated from the earliest records of the human race; and is believed to furnish food, even at the present day, to a greater number of human beings, than any other grain. It is supposed to be a native of India. There is held to be but one species—*oryza sativa*—common rice. But there are sub-species and varieties.

The rice plant is not unlike barley in appearance; the grain is covered with a thick yellowish skin or husk, and has, like barley, an awn or beard. Rice is spread over all the warmer regions of the old world. From the south of Europe its culture has lately extended to the more northern parts—to Westphalia, and even to the low countries. It appears to be a plant fitted in a remarkable degree to accommodate itself to different situations. Centuries have elapsed since it was introduced into the countries north of the Mediterranean—Greece, Italy and Spain. More recently it has extended to Hungary and central Europe.

The valuable large white rice for which the southern states are so justly noted, came to us without book or direction, from the most savage of the African islands, and from the fields of Hindoostan, then entirely under their native princes, in the years 1688 and 1696. It was at first planted on uplands, afterwards in swamps. It has spread itself throughout South America and the West India Islands.*

It flourishes most luxuriantly in the southern states. It was not, however, very extensively cultivated until a short time previous to the revolution. Yet we find that the export of rice in the year 1790, amounted to seventy-three thousand three hundred and twenty-nine tierces—about forty-four millions of pounds, which at twenty dollars a tierce, is one million four hundred and sixty-six thousand five hundred and eighty dollars. This, on an average crop, is the produce of only sixty-five square miles. By the report of the Secretary of the Treasury it appears that the exports of rice for the year ending October 1, 1837, amounted to one hundred and six thousand and eighty-four tierces, of the value of two millions three hundred and nine thousand two hundred and seventy-nine dollars.

* Rice was first planted in Carolina by Nathaniel Johnson, Governor of the Province, in 1668; but owing to the defect of the seed and other causes, its culture not proving successful, was abandoned. In the year 1695, a vessel arrived at Charleston, South Carolina, from Madagascar, the master of which, furnished a Mr. Woodward with about half a bushel of rice, of superior quality, and from this small beginning sprung an immense source of comfort as well as of wealth to the southern states. "So much for the remnant of a sea store left in the bottom of a bag."—*Editor.*

Rice is cultivated to the best advantage in low marshy grounds, or in situations where irrigation may be practiced with facility. It is decidedly a marshy plant—although one kind of it, the mountain rice, thrives on the slopes of hills, where it can only occasionally attain the necessary moisture. In rice growing countries the fields are prepared in trenches, in the bottom of which the seeds are planted regularly by the hand. The time this sowing takes place, generally early in May, depends measurably on the locality and the season. When the sowing is completed, the ground is flooded with water; the gates are then closed, and the seed germinates in the moist soil.

In about a month the fields are again inundated for the space of several days. An interval now takes place until July, during which time the plants are hoed and weeded. The water is again admitted, and is allowed to remain till the crop is fully ripe. General Thomas Pinckney has furnished the public with an interesting paper on the water-culture of rice; his experiments are detailed with great precision; and in practice they have proved highly beneficial.* The extensive cultivation of rice in the neighbourhood of large cities, has an unfavourable influence, it is thought, upon the health of the inhabitants.

The Farmer's Assistant says, we believe that almost every kind of soil is fitted for the growth of rice that is sufficiently moist and rich. We have seen it flourish in a moist sandy loam in North Carolina. We think it not improbable, taking into the account the disposition of this plant to suit itself to the varieties of climate, that at no very distant day it will be found practicable to mature the crop in almost any part of the middle states.

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8. THE CANARY GRASS, &c.

There can be no inducement for us to enter into the extensive cultivation of these and some other articles hereafter to be mentioned. They are merely introduced to record the resources of our agriculture—the capabilities of our soil and climate, to produce and bring to perfection, any thing we need, even in cases of necessity.

The cereal grasses that have been enumerated, afford the main part of the farinaceous food of mankind. Besides these, however, other grasses are cultivated or used for their seeds,

* See old American Farmer, vol. iii., for April 1823.

as cultivated Canary grass, floating meadow grass, hairy cocksfoot or finger grass. The *Canary grass* is an annual; a native of the Canary Islands, but now naturalized in several parts of Europe and South America; and it is raised, but in a limited degree, in the southern states. It flowers from June to August, and ripens its seeds from September to October.

It requires a loamy soil, in good heart, well pulverized; the seeds are sown in rows, at about a foot apart, as early in the spring as the state of the weather will justify; quantity of seed, from four to five gallons per acre. The after culture consists in keeping the soil well stirred and perfectly free from weeds. The common produce is from thirty to thirty-four bushels per acre; but under the best management it has often yielded fifty bushels to the acre. The use of the seed is chiefly as food for Canary and other cage and aviary birds. But it is of little economical importance.

Floating meadow grass is a plant tolerably productive of seeds, which are sweet and nourishing. They are collected in some parts of Germany, Poland, and other sections of Europe, whence they are brought to England and this country, and sold in the shops under the name of *manna*. The plant is too aquatic in its habits to admit of extended cultivation.

Hairy cocksfoot or finger grass is an annual plant; it is grown in sandy cultivated fields. In Poland and Lithuania it abounds by the road sides; and its seeds being collected and boiled with milk, in the manner of rice, are said to be esteemed. Many other grasses could be here enumerated as yielding seeds of sufficient size to be used as food; but none of them can be regarded as fitting subjects of cultivation for their seeds.

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9. BROOM CORN—*SUGAR SORGUM.*

The cultivation of broom corn is carried on to a very considerable extent in many of the rich intervals of New England; and no crop perhaps, pays generally better on the whole. Some towns on the Connecticut are almost exclusively devoted to its culture and the manufacture of its panicles into brooms, wisks, &c., a very simple process. It is somewhat singular, that its cultivation has been confined, until within a few years, almost exclusively to New England; and it is not less remarkable, that notwithstanding its importance, in no book on agriculture can any account of the history or the cultivation of this plant be found. It is not even mentioned, we believe, in the valuable agricultural books published in New

England. Its cultivation has, nevertheless, extended; and it may now be found in almost every section of the country. In some parts of Pennsylvania, New Jersey, Virginia and Ohio it is cultivated very extensively and with considerable profit.

The Rev. Henry Colman—we can have no better authority—says, that the seed is considered as about two-thirds the value of oats; and that mixed with corn it is excellent for the fattening of cattle and swine. The return of *seed* is often precarious, but still it is frequently abundant, and will often more than pay the whole expense of cultivation and preparing the crop for market. The seed varies from twenty to one hundred and fifty bushels to the acre, according to the nature of the soil, the quality of seed, culture and season. One thousand pounds of broom, and seventy bushels of seed to the acre, are considered a fair crop in those parts of New England where special attention is devoted to its culture. The quantity rarely falls below four hundred and fifty pounds per acre, and as seldom exceeds twelve hundred. The average, at the present day, is probably about seven hundred pounds to the acre, which, with very little extra attention, might be easily brought up to one thousand, now considered by many cultivators a fair crop.

The broom corn requires a good soil, either naturally fertile, or made so by the application of manures. The earth should be well pulverized; the preparation is similar to that for Indian corn. It will not only bear, but amply reward high cultivation. The seed—and very great care is to be observed in taking it from the largest and best of the preceding crop—is planted in rows; these rows are at a sufficient distance from each other to admit of easy culture with the cultivator. Sometimes they are dropped in hills, eighteen inches apart; four or five stalks are by some persons considered sufficient for a hill, others allow more.

The corn frequently attains a height of from twelve to fifteen feet, and, when uniform and in perfection, no crop is more beautiful. The New England practice is to table the corn; that is, to cut off the top or tassel, as the broom is called, and bending the stalks of two rows together, lay it down until it is seasoned and fit to be carried in. In the spring the remainder of the stalks are burnt in the field. This, we conceive, is poor economy, as they afford but little ashes. They would unquestionably prove a valuable addition to the compost heap, and should, therefore, as soon as they are topped, be transferred to the cattle and sheep yards. The scraping of the brush is an unpleasant business, and sometimes injurious to the eyes. From half a gallon to one gallon of seed is used to the acre.

The price of the broom has heretofore been subject to great fluctuations; but it is conceded on all hands, that at five cents a pound it is a good crop; it more frequently commands twelve.

The expense of cultivating an acre is variously stated. We have met with no account, as yet, exceeding the following, for which we are indebted to the Rev. H. Colman.

Statement of the expenses of cultivating an acre of Broom Corn in Deerfield Meadows, in the year 1832, by Mr. Alvah Hawkes.

Dr.			*Cr.*
May 12, 1832.			
One ploughing,	$1 25	By sale of 1000 lbs. broom, at 8½ cents,	$85 00
Holeing out, ⅓ day's work,	34	Seed, valued at	8 33
Ten loads manure, at 75 per load,	7 50		
Putting manure in hill,	2 00		
Planting, 1 day's work,	1 00		
Seed, 4 quarts, at 75 cents per bushel,	10		
First hoeing, 3½ days,	3 00		
Second do. 3 do.	2 50		
Third do. 2½ do.	2 50		
Horse and boy to plough for the season,	1 00		
Tabling and cutting up, 4 days,	4 00		
Gathering, carting, packing, &c.	2 50		
Expense of cultivation,	27 69		
Scraping 1000 pounds bark,	3 30		
Board of man, 5 days,	1 07		
*Rent of land, say	16 00		
	$48 06		93 33
			48 06
			45 27
		By error in rent of land,	10 00
			$55 22

* This must certainly be an error, as the interest of the land, provided it was valued at one hundred dollars per acre, would amount to six dollars only per annum.

It thus appears that when the crop was selling at a low price, eight and a half cents per pound, it produced a profit of fifty-seven dollars and twenty-seven cents; and if it be put down at the lowest price it has ever brought in the market, say five cents, it would still leave the cultivator twenty-two dollars and twenty-seven cents per acre. The season was unfavourable, and consequently the yield of seed was trifling.

Robert G. Johnson, Esq., of Salem, New Jersey, a gentleman well known for his extensive acquirements and great practical knowledge, furnished some time since, at the suggestion of the Editor of the Farmers' Cabinet, an account of a crop of broom corn raised on his plantation in the summer of 1839. He says:

Mr. F. S. Wiggins:

Sir—My land is a loamy soil, and in good condition, producing generally about sixty bushels of Indian corn per acre—of wheat from twenty to thirty—and of barley from thirty to fifty.

My usual method is to cart out all my manure from the barn-yard through the winter and early in the spring, so that the greater part thereof is upon the fields by the time the plough can be put into the land. The cultivation of the broom corn by Mr. Brown, (Col. Johnson's farmer,) and by him attended to until the brooms manufactured by him were sent to market, amounted, according to his estimate furnished me, to ninety-six dollars and fifty cents. While in conversation with him he drew from his pocket a paper containing the following words: "Was raised on eight acres of land, the property of Robert G. Johnson, broom corn that made four hundred dozen of brooms, that weighed one and a quarter pounds each. Many of the stalks measured sixteen feet six inches in length, and produced four hundred and thirty bushels of seed.

"Israel E. Brown."

I would observe that I commonly manure my land at the rate of from thirty to forty loads per acre—such was the dressing the land got previous to the planting of the broom corn. The land being in high tilth, produced, from careful attention, a most luxuriant crop of stalks; I think they must have averaged from fourteen to sixteen feet in height throughout the whole field. I have not been inclined to encourage the rearing of the broom corn more than a sufficiency for family use. I consider the broom corn a much more exhausting crop to the soil than any other grain. There appears to be an oleaginous quality peculiar to it, and somewhat analogous to flax seed, which in my judgment has a tendency to produce the impoverishment of the soil. The seed makes excellent food for hogs and cattle.

Its nutritious quality may easily be discovered from the fine colour and taste which it imparts to butter from the cows which are fed on it. The best way to use the grain is to grind it with a portion of oats—say about one-third of oats to two-thirds of the seed. Indeed it is so hard and flinty that it should always be ground before feeding it to any kind of stock.

Good broom corn seed weighs about fifty pounds to the bushel. Its value compared to oats may be considered as about half as much again; so that should the market price of oats be, say twenty-five cents per bushel, the broom corn seed would be worth thirty-seven and a half cents.

Brooms. I think there is a difference of twenty-five, if not thirty per cent. in the quality of brooms sent to market, from such as I generally use in my family. I always endeavour to procure from the manufacturer, and for which I pay him an extra price, such as are made from the stalks before the seed ripens on them. A broom made from such tops will last much longer than one made from the ripe brush. But the peculiar excellency of the broom consists in its fibres being more soft and elastic, and performing the act of brush-ing or sweeping, similar to the brush made of bristles, without injuring the carpet if used prudently. After the broom shall have been used in sweeping the parlour, and the finer parts worn away, it will then be as good to sweep the other parts of the house as the best new broom made from the ripe corn. Ladies who set so deservedly such a high value upon their beautiful Turkey and Brussels carpets, should purchase none other than such as are made from the unripe brush. The broom made from such may be easily known by the colour of the straw, which is that of tea or sage; the fibre or straw is much finer and of a softer feel than that of the broom made from the ripe corn—the colour of which is red, or inclining to red.

The Farmers' Register, for January, 1839, contains a paper read before the Agricultural Society of Fredericksburg, Va., on the cultivation, product, and uses of broom corn. From this paper, furnished the Society by Mr. William Browne, it appears that that gentleman, in connexion with a Mr. C. H. Hunt, having established a broom factory in Fredericksburg, cultivate ten or twelve acres with the broom corn. The experiment, both as to the culture of the corn and its manufacture into brooms, is, so far, very satisfactory. Messrs. Browne and Hunt work mules altogether, and feed them exclusively on the grain of the broom corn. At first it was ground and mixed with chop, but the drought stopping the mills, they were compelled to feed the grain unground, moistening it with water a few hours beforehand, to soften, and cause it to swell and expand. The mules not only appear as fond of it as of other food, but they continue in good order and perform their work with much spirit. Mr. B. says that he fed his cow on this grain for some weeks, during which there was a sensible increase in the quantity of milk beyond what she yielded when fed on bran and chop. In preparing it for the cow, boiling water was poured over it, and it was kept well covered in a close vessel, until the grain expanded and became soft. She ate it with great avidity. The grain is considered, generally, at least equal to oats for horses and cattle, and superior to buckwheat for hogs.

II. LEGUMINOUS PLANTS.

The seeds of which are used as food for man or cattle.

1. THE BEAN.

The bean is a valuable field plant, as affording food for live stock, and in part for man. It came originally from the east, and was cultivated in Egypt and in Barbary in the earliest ages of which we have any records; it spread from thence into Europe, from whence some of the best varieties have been introduced into this country. Of the beans which form the subject of cultivation in this country, there may be said to be, with respect to their uses, two general characters—those cultivated in the fields, and are thence termed field-beans, and those which are cultivated in gardens, and so termed garden-beans.

The varieties most commonly selected by our farmers, as a field crop, are known as the large and small white dwarfs, and the China bean. The two former are entirely white, and the latter has a spot of deep red upon it. The two former have more spreading vines, and do not ripen so soon as the latter, which grows with less vine or bush, yields well, and ripens early.

Light sandy lands are generally preferred in this country for beans; for upon such lands they do not run so much to vines, ripen earlier, and are more easily tended. English authorities state that it is well suited to the stiffer clays; that it is an exhausting, but cleansing crop. General ARMSTRONG, in his Treatise on Agriculture, states that the bean has a tendency to fit and meliorate a stiff soil for the succeeding crop.

There are three methods of planting the bean. The first in hills, the second in drills, and the third sowing broadcast. The adoption of either of these methods must be left to the judgment of the farmer, as the advantage of either will depend upon circumstances, the nature of the soil, whether it is free from weeds, and what crop is designed to follow.* The produce per acre varies according to circumstances; from twenty-six to forty bushels—as many as sixty have been raised in this country, but the crop was properly attended to. In England the average is about thirty bushels.

Cultivation of the Bean. An enlightened agriculturist,† furnished for the Agricultural Tracts, the following brief but comprehensive account of the method he adopted in the field culture of the bean.

Beans may be cultivated in drills or in hills. They are a valuable crop; and, with good care, are as profitable as a wheat crop. They leave the soil in good tilth. The China bean, with a red eye, is to be preferred. They ripen early, and are very productive. I cultivated beans the last year in three different ways, viz. in hills, in drills, and sowed broadcast.

I need not describe the first, which is a well known process. I had an acre in drills, which was the best crop I ever saw. My management was this: on an acre of light ground, where the clover had been frozen out the preceding winter, I spread eight loads of long manure, and immediately ploughed and harrowed the ground. Drills or furrows were then made with a light plough, at the distance of two and a half feet, and the beans thrown along the furrows, about the 25th of May, by the hand, at the rate of at least a bushel on the acre. I then gauged a double mould-board plough, which was passed once between

* Genesee Farmer, vol. ii. p. 82.

† JESSE BUEL, Esq.

the rows, and was followed by a light one-horse roller, which flattened the ridges.

The crop was twice cleaned of weeds, by the hoe, but not earthed. The product was more than forty-eight bushels, by actual measurement. The beans brought me one dollar the bushel last fall. The third experiment was likewise upon a piece of ground where the clover had been killed. It was ploughed about the first of June, the seed sown like peas, upon the first furrow, and harrowed in. The drought kept them back; but about sixty-five rods of ground, on which the experiment was made, gave a product of twelve and a half bushels. The crop was too ripe when it was harvested, and as it was cut with a scythe, I estimated that about two and a half bushels were left upon the ground. No labour was bestowed upon them from the time they were sown till they were harvested.

Harvesting. The bean should be suffered to ripen itself thoroughly—but not to become over-ripe. The period of ripening will be denoted by the skin of the seeds having acquired a yellowish leather-like appearance. They may be cut by the scythe or by the sickle. When the sickle is used the utmost care is to be taken that the plants be cut low, both on account of the value of the straw and of the saving of such pods as may be growing near the bottom of the stem.

The beans are to be formed into sheaves, by tying them with straw-ropes previously prepared; or, when peas are mixed with beans, by ropes formed of the stems of the peas twisted on the spot at the time of reaping. The English practice is, merely to lay the beans on these ropes in the first place, and leave them in the field for a few days to dry, before they are bound into sheaves. When the sheaves are bound, they are set up into double-rowed shocks, without any covering of head-shocks. The straw of the bean is nutritious and wholesome. For horses, it is reckoned little inferior to hay.

The bean is a plant subject to disease—the most common, a species of rust, by which it is affected in nearly the same way as wheat is by the rust or mildew. It is also liable to the attacks of insects.

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2. THE PEA.

The pea is supposed to be a native of the south of Europe—it has been cultivated in England from time immemorial—and in this country from its earliest settlement. It has been found growing spontaneously in the western sections of our country. The varieties of the pea are numerous; some of which are more and others less valuable for cultivation.

Of these the *field pea* alone comes within the range of our present purpose. Of this, there are two varieties, denominated from their colour the grey or white and the green,* both productive, and when separated from the skin that surrounds them, a food of excellent quality for man, wholesome, nutritive, and pleasant—and for cattle, whether in a dry or green state, much to be recommended. Sheep, cows and horses, are particularly fond of them; and hogs are more promptly and economically fattened on a mixture of pea and barley meal, in a state of acetous fermentation, than by any other food.†

The pea is extensively cultivated for use in its *green* state—and no species of cultivation is more profitable than this were it can be adopted—for the pea being ready for market in May and June, time is allowed for taking another suitable crop during the same season. The practice of gathering them in their green state, must be necessarily limited to the vicinity of cities and market-towns, in which they command a large price. It is rather, therefore, the province of the gardener than of the agriculturist.

The pea crop is a valuable one, combining peculiar advantages with both the wheat and pork husbandry of this country. As a preparation for wheat, nothing exceeds it. In the state of New York alone, thousands of acres are annually sown with peas, and of course, as many acres are prepared in the best manner for wheat. To hogs, the pea crop supplies the best of food, especially in the incipient stages of their fattening; and coming, as the crop fortunately does, to maturity at a season peculiarly useful for that purpose, gives them an additional value.‡

Soil and situation. A loose, warm soil, moderately rich, and the deeper and stronger for the lofty growers, is most favourable. Stable manure, or unreduced dung, recently turned in, will injure the crop—decomposed vegetable matter is the best manure that can be applied. The soil for the *early* crops should be very dry, and rendered so, where the ground is too moist, by mixing sand with the earth of the drills.

Sowing. After the ground has been well prepared or pulverized by cross ploughings and the liberal use of the harrow, the drill may be laid out two and a half to four feet distance to each other, and two inches *deep:* as peas grown without sticks require the least room, the seed may be distributed in the drill according to their size and season, and as near each other as the judgment of the cultivator may direct. From a bushel and a half to two bushels are allowed per acre. The distances

* The small June peas, the marrowfat, and the black-eyes, are cultivated to a considerable extent, and command, generally, fair prices.

† Treatise on Agriculture—Section ix.—The Plough Boy.

‡ Letters from a Father to a Son—No. xii.

vary according to the size, from a half to two inches—the latter space being considered best for the largest, and the first mentioned, the smallest kind. The land is then harrowed across, and thus the seeds are sufficiently covered.

The *after culture,* though simple, should be effective. When the plants are a few feet above ground, the expanding cultivator is to pass along the intervals, the teeth being set as near the rows of plants as possible without injuring them. Then, before the plants come into flower, a hand passes along the rows, and hoes up and removes all the weeds. This completes the culture of the pea, which will now grow with great rapidity, and soon cover the intervals.

Early hoeing, in the case of this plant, should never be neglected. The effect is not only to repress the growth of weeds, until the plant shall have required sufficient strength, but, as in nearly all cases of tilling the ground about the stems, to give increased vigour to the growth of the plants.

From the manner of the growth of the pea, and from its stems quickly stretching over the intervals, the process of hoeing should be commenced early, and perseveringly persisted in. After the first crop of weeds is destroyed, the plants themselves will generally stifle all that may spring up during the subsequent period of their growth. This is the system under which the pea is beneficially cultivated. The land will thus be cleaned in an efficient manner, and prepared for any crop of grain that is to follow.

In *harvesting,* the ordinary management of the pea differs but little from that of the other kinds of grain mentioned. Some employ a tool called a peas-mate, which is merely the half of an old scythe fixed to a handle. With this they are cut, and rolled up into what are called wads or wisps, and left to dry. In other cases, old blunt hooks are employed, by pulling which towards the reaper, the plant is torn and broken at the surface, rather than cut.

Diseases and Insects. The pea, like the bean, is subject to various diseases. Like it, it suffers from rust, and is rather more subject to injury from insects at the roots. The pea-bug is the most formidable enemy that the crop has to contend with in this country; but it is believed that, with proper precautions, the crop can be entirely rescued from the depredations of these mischievous insects.

It has been recommended to place the seed in a basket, and immerse the basket in a kettle of boiling water; spread the seed immediately on a floor, and plant as soon as possible. This process, while it is said to destroy the insect, does not affect the vitality of the seed. But the greatest precaution is to be observed, combined with good judgment. Others strongly recommend the sowing of *old seed.* The Hon. TIMOTHY PICKERING says, that late sowing is an effectual remedy: and Col. WORTHINGTON, of Rensalear county, New York, confirms it. He sowed his peas on the 10th of June six years in succession, and a bug has never been seen among them; whereas his neighbours, who have not adopted his practice, have scarcely a pea without a bug in it.*

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3. BUCKWHEAT.

THIS plant is cultivated for the farina of its seed. It is a native of Asia; whence it was carried into Africa, and thence by the Moors was introduced, four centuries since, into Europe, from whence the species, *Polygonum Fagopyrum*—common Buckwheat,—so extensively cultivated in the United States, was derived. Travellers assert, that it grows wild and most luxuriantly in some parts of our western country. It is an annual, with upright leafy stems, and rising from one to three feet in height. This plant possesses numerous excellencies, which have been too long neglected or overlooked by many farmers.

Soil and preparation. Buckwheat flourishes best in a mellow, dry, loose, sandy soil—it will, however, grow on the poorest soils, and produce a crop in from three to four months; but a good crop can only be expected from a soil tolerably rich.† It should never be sown on wet poachy ground. The soil may be prepared in different ways, according to the intention of the future crop; and for this there is ample time, whether the crop is designed for seed, or to be turned under by the plough. The application of a bushel of gypsum, when that manure is suited to the soil, will prove highly beneficial to the crop.

Sowing. In the latitude of Chester county, if for seed, the month of June is generally preferred. The surest way is to sow it sufficiently early to enable it to come to maturity before the fall frosts. "In the state of New York, farmers sow it in August with winter wheat. It affords them a ripe crop in the

* Memoirs New York Board of Agriculture, vol. ii. p. 23.

† The grain of Buckwheat affords a favourite article of food—is much cultivated in some districts—particularly those which are rough and hilly. It is considered a severe crop upon the soil, and is rarely sown upon highly improved land—but it is admirably adapted to subdue new or wild lands. The flowers are a favourite resort of the honey-bee.—*Flora Cestrica,* by Dr. WM. DARLINGTON, p. 253.

fall, without injury to the wheat, which grows with, and succeeds it."* The quantity of seed to the acre is determined by the method of planting—if sown broadcast, as is usual, a bushel is sufficient—if in drills, half that quantity will answer.

The *harvesting* of buckwheat, and its subsequent management, is similar to that of the other grains. It may be cut by the scythe; after which it should remain in the field a suitable time, previous to being housed. As it is very liable to heat, it is recommended to put it in small stacks of four to six loads, instead of large stacks, or being placed in the barn.

The *produce* varies greatly under different states of soil and culture. From thirty to forty-five bushels may be reckoned as an average yield in a favourable season—though from sixty to eighty bushels are not unfrequently raised. It is in flower throughout the summer, and would yield much larger crops if there was uniformity in its ripening.

This grain is used for a great variety of purposes. In the old world, it is mixed with other grains, and (as it affords a nutritious meal, not apt to sour on the stomach,) it forms a large portion of the bread used by the labouring classes. In our own country, for culinary purposes, it is used chiefly for making what is termed buckwheat cakes—an article celebrated throughout the Union.

The *seeds* of buckwheat are given advantageously to cows, poultry and hogs; properly prepared, it is very nourishing. The *stem* or straw of the buckwheat, if cut in season, is said to afford an excellent and agreeable fodder for cattle, especially milch cows. An intelligent and observing agriculturist near Baltimore,† says that for milch cows it is better than the best timothy hay; they eat it with equal avidity, and if it has not been exposed too long to the vicissitudes of the weather, it will prove equally nutritious. It promotes the secretion of milk; and when cut and boiled or steamed, it makes a most acceptable slop.

It is of an enriching nature—not an exhauster of the soil, as some have supposed—having the quality of preparing for wheat or any other crop. The principal value is not so much in the seed it yields, as the great good it does the land by shading it from the sun. One of the purposes to which it has been applied, from time immemorial, and for which, from the rapidity of its growth, it seems well adapted, is the ploughing of it down green as a manure for the land.

"We cannot too much recommend, after our old and constant practice, the employment of this precious plant as a ma-

* Complete Farmer, page 148.
† E. P. Roberts, Esq., late editor of the Farmer and Gardener.

nure. It is certainly the most economical and convenient the farmer can employ. A small quantity of seed, costing a mere trifle, sows a large surface and gives a great crop. When in flower, first roll, and then plough it in, and it is soon converted into manure."* This crop, it is said, is effectual in destroying that pest of the farmer called *quick grass*, *couch grass*, and probably known by other names. The plan is to sow as early as possible; as soon as the buckwheat comes fully into flower, roll it, and turn it under; the seed for another crop is then sown and harrowed in; this springs up, and has time, if the season is favourable, to ripen before frost sets in.†

* C. Serres, editor Théatre D'Agriculture.
† Mr. Taylor, in Maine Farmer.

VII.—PLANTS CULTIVATED FOR THEIR ROOTS, TUBERS AND LEAVES.

I. THE POTATO.

This most important plant is a native of this country—and in view of its great value, Professor Low has very justly observed, that it is considered as the most precious gift of the New World to the Old,—as it now forms a great portion of the food of the inhabitants of Europe. It was first introduced into England by the brave and unfortunate Sir Walter Raleigh. It is said to have been received in Spain from South America, during the sixteenth century. The Spaniards called it *battatas*. It appears to have found its way first to Italy from Spain, and in 1588 it was known in Vienna.

The history of its introduction into the various countries of Europe and Asia, is remarkable. When introduced into France, and subject to the very imperfect methods of analysis of that day, its cultivation was proscribed by the government, on account of the supposed deleterious matter it contained. It was every where received with tardiness, distrust or contempt—while another plant of the same natural family, the *Tobacco,* possessing merely the properties of a narcotic, was no sooner made known than it was received with eagerness in every part of the habitable world.

It grows exempt from the hazards to which almost all other crops are subject. Its tubers ripen under the earth, and so are defended from the effects of winds and storms. It yields a larger quantity of fecula, [starch or farina,] which can be obtained separately from the tuber. It may be used in its natural state, either directly as the food of man, or for the feeding of domestic animals. In the latter case it should invariably be steamed.

The potato has a wider range of soils and climate than most other cultivated plants. It grows on soils the lowest in the scale of fertility, and is capable of supporting a greater number of human beings upon the same extent of ground than any other plant cultivated in the temperate regions. These properties, and its general consumption, has unquestionably lessened the hazards of famine, but it has added immensely to the comforts of the labouring people—hence we not unfrequently hear emigrants speak of it as *the manna of the poor.*

Under every system it is a beneficial object of culture—and to the settlers of new countries, it is, of all the cultivated plants, the securest, the most easily produced, and the least liable to the contingencies of the seasons. It rises with a branched and succulent stem, bearing white or purplish flowers. The fruit is a round berry, generally about the size of a plum, containing numerous small seeds. The root has many tubers attached to it, of a round or oblong form.

The potato may be *propagated for its seeds*, by which *new* varieties are obtained—or, by planting the tubers, in which case plants, similar to the old, are produced. When raised from the tubers, they yield their full produce in one season—that in which they are planted; but when propagated from their seeds, several successive years are required to bring the tubers to their full size. The tuber, therefore, though it is sometimes planted entire, is, for the most part, cut into several pieces, as each one generally contains many buds, (eyes,) or gumens, from each of which a stem will arise.

Obtaining new varieties. We have already observed that new varieties are obtained by cultivating from the seed. Many of the early varieties do not blossom at all. This difficulty has been surmounted, and the habits of the plant illustrated, by an expedient adopted by a scientific culturist, T. A. KNIGHT, Esq. The tubers are removed by the hand as they are formed, in consequence of which the vegetable juices are directed to the stem, and thus blossoms and seeds are produced.

The mode of procuring new varieties from seeds is simple, but tedious. Some of the largest and best formed berries, when fully ripe, which is denoted by the change of their colour, and by the stalk having become withered, are plucked, and the pulp separated from their seeds, which are then dried in the sun. These seeds are to be sown in the following spring, and the produce to be taken up early in October. They will then have nearly obtained the size of small plums. The best of these are to be selected and carefully preserved. In the month of April following—in some latitudes early in May—they are to be planted at a distance from one another of from fifteen to eighteen inches; and when they rise about two inches above the ground, the fresh earth should be drawn lightly around them, and they must be kept free from weeds throughout the season.

When they have arrived at maturity, which will be denoted by the decay of the several stems, they are to be taken up in succession as they ripen—keeping the *early* separate from the *late*. The produce of each stalk is again to be planted in the following spring. A judgment of the properties of the potatoes will then have been formed, and those only are to be reserved for cultivation which are approved of. It will be found that, whatever has been the parent stock, the seeds will produce numerous varieties, some white, some dark in the colour, with tubers of different forms—round, oblong and kidney-shaped. This is a tedious process, but necessary when it is desired to cultivate new varieties from seeds.

Preparation of the land. In preparing the land for potatoes, it ought to be ploughed late in the preceding autumn—a slight sprinkling of lime over the ground before the turning of the furrows, which should be as deep as the nature of the soil will justify—will be found beneficial to the crop. The ploughing should be lengthwise, so as to keep the ridges dry. In the ensuing spring, as soon as the other labours of the farm will allow, and the land is sufficiently dry, it is to be cross-ploughed and harrowed, by repeated turns of the harrow, in every direction.

The roller also, if necessary, is to be employed to reduce the soil; and all the root-weeds are to be carefully collected and carried away, to be formed into a compost, as is described in page 61. The land is then ploughed in a direction crossing the last ploughing; that is, the plough is carried across the field diagonally, as it is not only desirable, but important, that each alternate ploughing should cross the previous one; and as the next turn forms the drills they will be in the direction of the former ridges. Thus all the ploughings are made to traverse each other.

The distance from centre to centre, or in other words, the breadth of the *drills* at the base, vary from twenty to thirty inches. The drills, if not formed at the last ploughing as above mentioned, may be laid out by means of a small drill plough, calculated to turn a deep narrow furrow.

The manure, when the drills are formed in this manner, is to be spread in suitable quantities in the hollows. Dung, in all cases, it is known, acts most quickly upon young plants when it is well prepared; but in the case of the potato, it is not necessary. It should, however, undergo some slight fermentation.

The quantity of manure varies according to the character of the soil and other circumstances. From twenty to thirty common loads of barn-yard manure is considered sufficient, when, instead of being deposited in the drills, it is spread on the surface and ploughed in. A liberal application in either case is necessary. When the plan of ploughing in the manure is adopted, the addition of about twenty bushels of lime may be applied with great benefit; but if the "planting is under a fresh sod, the liming should be deferred until the tops are just coming through the ground, then harrow, spread the lime, and harrow again." It is stated by JOSEPH CLOUD, Esq., one of the Vice Presidents of the Philadelphia Society for Promoting Agriculture, that for two or three years past several of his friends had experimented on the culture of potatoes, substituting the sulphate of lime for putrescent manures. The lime was strêwed liberally along the furrows, and directly upon the potatoes. Their subsequent treatment was after the usual manner. The results proved highly satisfactory—particularly the last season—arising, probably, from a defect of moisture, to promote the decomposition of vegetable matter. The cause, whatever it may have been, remains to be developed. The effects are of vast importance in the science of agriculture.

The proper manure, under ordinary circumstances, is that formed and prepared in the barn-yard. Bone dust has been employed with good effect. Lime has been found very beneficial, though by some its application has been condemned. It is thought to destroy worms, slugs and insects, and to bring the crop earlier to maturity. A large table spoonful of plaster thrown upon the potato in the drill, is highly recommended, as tending greatly to increase the crop.

Planting. As soon as the manure is spread along the hollows of the drills, the potatoes are to be planted. The potato, or the sets, as the case may be, are placed directly upon the manure, from ten to twelve inches from each other. In this operation the planter is directed by the eye. The seeds are now covered by splitting each drill, so that the top of the new drill formed is immediately above the hollow of the old one. This simple series of operations completes this method of planting the potato.

The time of planting varies according to the latitude, the season, and the state of the farm work. They have been planted in New Jersey and Pennsylvania as early as the fifteenth of March, and as late as the fifth of August. These are the extremes, and cannot be recommended, though fair crops have been produced. The best time is from the first to the twentieth of May. Good crops depend upon tillage, seed, soil, manure, and the season.

There are other modes of planting preferred by many intelligent farmers. The practice, once universally prevalent, of hauling up the ground, and raising high hills about potatoes, only to turn off the water which the crop needs, has not been able to abide the light of science or the experience of modern times. It is now almost universally exploded as absurd, unphilosophical and mischievous to the crop.*

On the selection of seed. Great care should be taken to select the largest, best, and fairest, for seeding. It is a rule alike applicable to the vegetable as the animal tribe, the more perfect the parent, the more perfect you may expect the progeny to be. The best *varieties* should be carefully sought after—and as the very best are in reach of every culturist, no one is in the least degree excusable for planting an inferior kind.

The *after culture* is simple and easily effected. When the plants have appeared above ground, the cultivator or horse hoe is to be passed along the intervals. The object of this is, to remove the weeds and pulverize the soil. The work should therefore be efficient and well done. As it is advisable for a hand to follow the cultivator with the common hoe, the loosened earth may be lightly drawn around such plants as appear to require it. In the course of two or three weeks the same operation is performed, which most generally completes the culture of the potato, as they grow with great rapidity, their stems spreading over the intervals and covering the entire ground.

Time of gathering. This ought to be done when the potatoes are ripe, and not before. On the small scale the operation is performed by digging them with the potato-hoe, a pronged fork; but on the large scale it is performed by the plough. The plough, from which the coulter has been previously taken, is to pass with a deep furrow along the centre of the drill; it then returns by the same drill, reversing the other half so that all the tubers are turned up. The potatoes thus turned up, should be instantly collected into baskets, &c.

One matter of vast importance is to be observed in the gathering of potatoes. Immediately on being taken from the earth, they should be placed in a situation in which they are completely protected from the action or influence of the sun, air or light; and they should be housed with as little delay as possible. The old practice of suffering them to remain in small heaps in the field, was highly injurious, and cannot be too strongly reprobated. It was the fruitful source of great complaints against this valuable root. Potatoes thus exposed, are invariably watery.

The uses to which the potato is applied, are various—as an article of food it is deemed indispensable. It is found alike on the tables of the rich and poor. For years past the attention

* Letters from a Father to a Son—No. xiii.

of farmers has been directed to the culture of potatoes for the purpose of feeding stock; but since the merits of the ruta-baga have become known, and the cultivation of the sugar-beet extensively introduced—its culture for this purpose—though it cannot and ought not to be superseded—will be in a greater measure diminished. *Starch*, of a most superior quality, is also manufactured from the potato.

But although potatoes may be given to live stock in their raw state, and it is frequently convenient to give them in that state, yet various benefits may be derived from giving them steamed or boiled. In this state they are relished by every class of our domestic animals, and afford food in a high degree nourishing and salubrious. Steamed potatoes, mixed with cut straw and hay, may be given advantageously to dairy cows, or any other kind of cattle; but it is thought that steamed food is not generally attended with the same benefit to ruminating as to other animals. To hogs they are given (steamed) with the best effect. When poultry is reared in quantity, their food may be considerably economized by mixing the potato with meal. An apparatus for preparing the potato for these various uses by steam will be described.

We cannot, probably, do our readers a greater service in this place, than by publishing, as nearly entire as our limits will allow, the statement of Gen. A. W. Barnum, of Vergennes, Vermont, relative to his method of culture. Gen. B. has been, perhaps, the most successful cultivator of potatoes in this country.

Preparation for Planting. Whatever soil may be selected for this purpose, to ensure a large crop it should be highly manured with compost decomposed vegetables, or barn-yard manure. The latter I consider preferable when it can be obtained with convenience; if raw or course be made use of, it should be spread immediately before the first ploughing, on the same day, to prevent the evaporation of its best qualities, which will rapidly depart if left exposed to the sun and atmosphere.

The first should be deep ploughing, and may be done as early as suits the convenience of the cultivator. If a stiff marl or clay soil, it would be well to have it ploughed late in the fall previous to planting. Where compost, or other substances not liable to fermentation, are intended as a manure, it is better the spreading should be omitted until just before the last ploughing, after which it should be thoroughly barrowed fine and smooth as possible; then take a narrow light cultivator, or small plough, calculated for turning a deep narrow furrow,—with this instrument lay your land in drills twenty inches asunder and four inches in depth, running north and south if practicable, to admit the rays of the sun to strike the plant equally on both sides; put into the bottom of the furrows or drills about two inches of well rotted barn-yard manure, or its equivalent,—then drop your potatoes. If of the common size, or what is more important, that they contain about the usual quantity of eyes, (if more, they should be cut to prevent too many stalks shooting up together,) put a single potato in the drills or trenches ten inches apart; the first should remain uncovered until the second one is deposited, to place them diagonally in the drills, which will afford more space between the potatoes one way than if laid at right angles in the rows. The covering may be performed with a hoe, first hauling in the furrow raised on each side of the drill; then carefully take from the centre of the space the soil to finish the covering to the depth of three and a half or four inches. By taking the earth from the centre of the space on either side to the width of three inches, it will leave a drain of six inches in the centre of the space, and a hill of fourteen inches in width, gently descending from the drill to the drain; the width and depth of the drill will be sufficient to protect the plant against any injurious effects of a scorching sun or drenching rain. The drains in the centre will at all times be found sufficient to admit the surplus water to pass off. I am not at all tenacious about the instrument to be made use of for opening the trenches to receive the manure and potatoes; this work should be well done, and may be performed with a common hoe with much uniformity and accuracy, by stretching a line to direct the operation. It is true that the labour cannot be performed with the same facility as with a horse; but it can be better done, and I think at less expense, taking into consideration the labour of the man to hold, the boy to ride, and the horse to draw the machine.

Dressing, Hoeing, &c. When the plant makes its appearance above the surface, the following mixture may be used: For each acre take one bushel of *plaster* and two bushels of good *ashes*, and sow it broadcast as even as possible. A moist day is preferable for this operation; for want of it, a still evening will do. I consider this mixture decidedly more beneficial and much safer than plaster or ashes alone. The alkali and nitre contained in the ashes loses none of its fertilizing qualities in a moist season, and the invaluable properties of the *plaster* are fully developed in a dry one, by decomposing the atmosphere and retaining to a much later period in the morning the moisture of the evening dews. There are but few plants in our country that receive so great a share of their nourishment from the atmosphere as the potato. The time for dressing or hoeing will be found difficult to describe, and must be left to the judgment of the cultivator. It should, however, in all climates, be done as early as the first buds for blossoms make their appearance.

The operation of hilling should be performed once and *once only* during the season. If repeated after the potato is formed, it will cause young shoots to spring up, which retards the growth of the potato and diminishes its size. If weeds spring up at any time, they should be kept down by the hand or hoe, which can be done without disturbing the growing stalk.

My manner of *hoeing or hilling* is not to haul in the earth from the spaces between the hills or rows, but to bring on fresh earth sufficient to raise the hill around the plant one and a half or two inches; in a wet season the lesser quantity will be sufficient,—in a dry one the larger will not be found too much. The substance for this purpose may consist of the scrapings of ditches or filthy streets—the earth from a barn-yard that requires levelling—where convenient it may be taken from swamps, marshes, the beds and banks of rivers, or small sluggish streams at low water. If planted on a clay soil, fresh loam taken at any depth from the surface, even if it partakes largely of fine sand, will be found an excellent top dressing. If planted on a loamy soil, the earth taken from clay-pits, clay or slaty soil, will answer a valuable purpose. In fact, there are but few farms in the country but what may be furnished with some suitable substance for top dressing if sought for. The hoeing and hilling may be performed with facility by the aid of a horse and cart; the horse travelling in the centre of a space between the drills—the cart wheels occupying the two adjoining ones—thereby avoiding any disturbance or injury to the growing plants. The time for collecting the top dressing may be regulated by the farmer's own convenience, the earlier the better, deposited in large piles in or near the potato field, in the most suitable place for distribution.

I have frequently tried bed-planting, (or planting in beds,) with uniform success. On moist lands, in a stiff or heavy soil, I consider it preferable to any other mode. To do it properly, lay your land in beds of from ten to twenty feet in width, raised in the centre with a plough by back furrowing, after the last harrowing, which should be thoroughly done, is performed, and left crowning with a gradual descent from the centre to the alleys. The proper width and height of the beds must depend on the situation of the land, and may be regulated by the judgment of the cultivator. In clearing the alleys, which need not exceed sixteen or eighteen inches in width, the labourer should stretch two lines the proper distance on each side the alley, and throw upon the beds with a shovel the earth necessary to be removed.

The use of lines may be by some considered a useless expenditure of labour. Not so—the regularity and neatness of appearance will be an abundant remuneration for the trifling time occupied in stretching the lines.

After the land is prepared for planting, strike it out in drills or trenches, as before directed, twelve inches asunder; in these drills drop the potatoes twelve inches apart, (diagonally,) to be covered, hoed, dressed, and managed in the same manner as in field culture, with the exception of making a drain in the spaces between the drills, which is unnecessary, and should be avoided. In filling the trenches, dressing, &c., the horse-cart must be dispensed with, and a hand-cart or wheel-barrow substitnted.

In recommending the drills north and south in field planting, I did not wish to be understood that other more valuable considerations should be abandoned for this practice; it is desirable it should be so where the level or moderate descent of the land will admit of it, but if too steep and liable to wash, care should be taken to avoid this evil by running the drills in such direction as may be required to maintain a proper descent, even if it should be necessary to run them in curved lines, or wind around a steep hill to preserve the required descent to admit the surplus water to pass off.

In communicating my experiments to some of my neighbouring farmers, who are always in a hurry, and run over with the plough two acres of land in half the time required to do justice to one, their reply generally is, that my tedious mode of cultivating has too much *piddling* and small labour for their patience, and persist in their accustomed manner of half ploughing, half planting and half hoeing five acres of good land, and not obtain more potatoes than one, properly cultivated, would produce, thereby losing half their labour and seed, besides the use of four acres of their best land, which might be converted to other valuable purposes.

I should think that intelligent farmers, by a little reflection, would perceive the folly of pursuing the usual wasteful practice of planting potatoes in rows and hills four feet asunder, leaving four fifths of their land unimproved, and subject to a rapid waste of its most fertilizing qualities, by being nakedly exposed to the washing of drenching rains, and the evaporation of the atmosphere; and after all their labour, may consider themselves fortunate if they obtain two hundred bushels to the acre, which exceeds the average yield in this section of country. By pursuing the course I have recommended, in ordinary seasons, on a good soil, you may rationally calculate on a crop of from eight to twelve hundred bushes to the acre.

To such farmers as complain of my tedious and piddling mode of culture, I have only to remark, if they will *piddle* their land in the same manner, even if they waste half their crop, they will find themselves richly rewarded for their whole labour in the benefits they derive by this preparation in succeeding crops. I would also add, that I believe it is generally acknowledged, that rotation in most kinds of crops is desirable, but none more necessary than potatoes; even a second crop on the same ground well prepared, will be found to degenerâte in quality and quantity.

Location. The district of country in North America best adapted to their growth, taking into consideration quantity and quality, is situated between the 2nd and 10th degrees of east longitude, (from Washington,) and between the 42nd and 50th degrees of north latitude. They are grown to a very considerable extent much farther north, south and west, but in diminished quantities and inferior qualities.

Soil. A rich marl or clay is perhaps the most productive; a strong moist loamy soil, (the newer or less it has been cultivated the better,) is the most convenient and least expensive soil to grow them on. Most soils common to our country will produce them in great abundance and perfection; the more rapid the growth, the better the quality.

Season and Planting. In this respect they are a most accommodating crop, allowing the farmer in the southern and central part of the designated district twenty or thirty days to perform the operation. The particular time depends in a very considerable degree upon the climate. In the region of my residence, (the 44th degree of north latitude,) they may be planted from the 10th of May to the 15th of June. At the extreme north of the described limits less latitude is afforded for seed time and harvest. The good husbandman in that climate should make all practicable preparation for his crop in the fall, and plant as early in the spring as the ground is sufficiently dry and warm. Here the growth is extremely rapid, not requiring more than from ninety to one hundred and ten days to perfect it. The quantity will not be quite so great as with us, but superior in quality.

Kind of seed to be planted. This is a question of too much difficulty for me to answer satisfactorily to myself, or instructive to the numerous inquiries of my correspondents; the kinds and qualities in a single neighbourhood are too numerous and their names too local and variable to admit of an intelligent reply. The female of this plant, (like most of her sex,) is so jealous of her rights and privileges, and so tenacious of cultivating a friendly intercourse and connection with her neighbours, that the blossoms in fields at two hundred yards distance, planted of different kinds of seed, are frequently found contributing liberally with each other, (by the aid of a gentle breeze,) a portion of their generating *farina*, which is generously received and kindly nourished. The product of this connection strongly partaking of the properties and appearance of both, many of them in apparent equal parts. Plant this mixture a few years in a place of safety, and it will be found that the weaker plant will gradually yield to the stronger, until the one most productive and best suited to the climate will be produced in its original and unadulterated purity. The fact goes far in satisfying me of the cause of our frequent disappointment in not finding seed at all times producing its kind. We have abundant means, with a little care and patience, of supplying ourselves with every variety of potatoes, the growth of which is adapted to our climate.

The wise Provider of all good things has kindly furnished us with the means of providing ourselves with innumerable kinds and qualities of this vegetable. The ripe balls or seeds from a single stalk, will produce by three seasons' planting almost countless varieties of every colour, shape, size and quality, which the country has heretofore produced, and something new in addition. The first season's planting they will be small and tender, the second larger, and the third of suitable size for field planting. The only answer I can give to the inquiry for the right kind of seed, is to recommend to the farmer that kind to be procured in the vicinity most productive, except a small quantity, if he possesses them, of a superior quality for table use. In changing seed, which will occasionally be found beneficial, if removed from any considerable distance, should be taken from the north: the growth will be more rapid, consequently the quality better, and in southern climates the quantity greater for the first season at least.

Time for gathering. This ought to be done when the potato is ripe, and *not before.* The idea so generally entertained, that an early frost which nips the top and destroys the vine prevents the further growth of the potato, is a mistaken one, and ought to be exploded. On the contrary, if it has not at this time attained its full size and weight, it grows more rapidly; the nourishment required for sustaining the top is transferred to the root. From a knowledge of this fact, satisfactorily tested, I am inclined to believe, that by clipping the bushy part of the top with a scythe or other instrument, after the ball has attained its full size, the crop would be greatly benefitted by the operation. I have made a few experiments of this kind, all tending to confirm my belief, but not sufficient to warrant me in making the broad unqualified assertion of the positive correctness of my opinion. I hope agriculturists, in different sections of the country, will lend a helping hand to aid in testing the correctness or incorrectness of my doctrine in this particular. The green tops are excellent food for cattle or swine; if left on the field will produce no injury, but serve to enrich the soil.

Housing and Wintering. The erroneous practice pursued by our best farmers generally, induces me to state the manner I have pursued for years with unvaried success. To preserve five or six hundred bushels, I make a box or bin four feet wide, three feet high, and sufficient length to contain the required quantity,—have the joints well fastened and made as tight as possible—put into the cellar on skids, raising it three or four inches from the cellar bottom. If the potatoes are intended to be taken out at different times, two or three partitions should be put in crosswise of the bin, to prevent such as are not required for immediate use from exposure to the atmosphere. After this preparation is completed, the next operation is gathering and housing them. Here I must again dissent from the usual practice of farmers generally. Instead of leaving them in the sun and wind to dry, after digging, in small parcels, in carts or heaps, they should be immediately covered with the tops, or something else, even if they remain in the field but a few hours. This destructive practice I think must be entirely attributable to want of reflection. It is the sole cause which produces the evil so much complained of, by us called the watery potato—by the Irish the winded potato—destroying not only the flavour, but a great portion of the nutriment. In fact, sun, wind and rain are as destructive to a new dug potato, as moonlight is to a fresh caught fish. When your potatoes are removed to the cellar, put into the bottom of the bin two inches of fresh earth; then fill one apartment with potatoes, within three or four inches of the top—immediately cover it with tough grass turf, cut up with the spade a little dove-tailing, to the thickness of three or four inches, cover them with the turf, grass side up, packed close and pounded down with a wooden maul, to exclude as much air as possible. In this manner, in a cellar of suitable temperature, they may be kept fresh and good for a year without germinating. No danger is to be apprehended of having too much dirt stick to the potatoes—it assists in preserving them. An occasional sprinkling of fresh earth among them will be found serviceable.

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2. THE SWEET POTATO.

The sweet potato is supposed to be a native of the West Indies. It was introduced into many parts of Europe, through Spain, soon after the discovery of America, and is, most probably, the species spoken of by all those ancient writers who allude to it under the name of *battatas*. They were carried from Spain to England; these were called the Spanish sweet potato. In 1586, Sir Walter Raleigh, on his return from Carolina, introduced their culture into Ireland.* Its true botanical name is *convolvolus battatas.*

The sweet potato cannot be cultivated to any extent or profit north of the 41st degree of latitude. In the lower counties of New Jersey, and in the southern states, it flourishes luxuriantly. It delights in a mellow sandy soil, and the richer the better.

This excellent vegetable would be more extensively cultivated but for the great labour of planting and cultivating them in the usual mode, and for the difficulty of keeping them in the winter.

To obviate the first difficulty, I have, for about twenty years, ceased making hills altogether, and planted in ridges. I break up the ground well, and if necessary, harrow it—then with a barshear or cary plough, throw three furrows together. To complete the ridge, take a weeding hoe or fine rake, and draw

* By some writers it is said to be a native of the east, and to have been very early scattered throughout all southern Europe. Others, with perhaps more propriety, insist upon its West India origin, allege that it was taken thence to the Philippian Islands, and afterwards dispersed over Asia and Europe.

the dirt up first on one side and then on the other, to about the height potato hills are usually made. Open a trench on the top of the ridge and drop the slips five or six inches apart, cover with the hand about two inches deep.

This mode is attended with several advantages—requiring less ground, less labour in preparing the ground, less in cutting the seed roots, less in bending ridges than hills, and greatly less than digging. The last operation is done mostly with the plough. After clearing off the vines run a furrow along the ridge, taking down about two-fifths on one side, return and throw off as much on the other side, leaving about one-fifth in the middle, nearly full of potatoes, which can be easily torn to pieces with the hand. A hoe will be necessary to move the dirt thrown out by the plough, so as to facilitate the picking out of the potatoes.

This mode of cultivating and taking up the crop, reduces the labour in my estimation nearly one-half.

To obviate the difficulty as to keeping, I put my potatoes in a garner in the cellar, putting chaff or dry dirt around and on them—put them up the same day they are dug. When freezing weather comes on, close the cellar windows. In this way I had sweet potatoes for the table throughout the last cold winter.

Plant about the first of April, and be sure to dig after the first frost hard enough to bite the leaves.

III. THE TURNIP.

English Turnip and Ruta-Baga.

"It would have been perhaps more consistent with due order in the arrangement of a work on husbandry, to have commenced with the cultivation of turnips—as the foundation of an alternate system of tillage—rather than with the growth of grain; and had we undertaken to direct the practical management of any one farm, we should have adopted that plan."*

It should, however, be borne in mind, that, although we furnish the best details with which we are acquainted, regarding the culture of crops, yet we only profess to treat of them *separately;* leaving the reader to judge for himself of the best course of cropping, according to the peculiar nature of his land.

The turnip is said to be a native of the sea-coast of the north of Europe, where they are found growing spontaneously. There are several species, and numerous varieties of the turnip; but those which specially require our attention, are—1. The common turnip. 2. The Swedish turnip, or RUTA-BAGA. The turnip culture was introduced into England about two centuries since, by Secretary TOWNSEND. It was bitterly opposed by the British farmers; but he faultered not in the good work, but persevered and lived to witness a complete revolution, and the almost universal culture of the despised turnip,

* Farmers' Series, Library of Useful Knowledge, p. 231.

throughout the kingdom. The ruta-baga is of recent introduction.

Turnips and clover are now the two main pillars of British husbandry. They have contributed more to augment and increase the fertility of the soil for producing grain—to enlarge and improve the breeds of cattle and sheep—and to afford a regular supply of butchers' meat throughout the year, than all other crops combined.

The soil, preparation of the ground, mode of culture, and general management of the common turnip and the ruta-baga, are in all respects similar. They both require a very finely pulverized soil, which is accomplished only by repeated ploughings and harrowings, as hereafter described. In all cases where the crop is intended to be followed by wheat, the land should be well manured previously to the first ploughing.

Soils. The soils suited to this crop are of the lighter kind; they are grown on all comparatively dry soils, including the loams, and under almost all the variations of climate. Their cultivation on cold and tenacious clays cannot be recommended. The more preferable soils are those which grow good Indian corn.

Preparation of the soil. With us, though there are many exceptions, turnips are generally a *second* crop. The land is ploughed with a deep furrow immediately after harvest, usually in the direction of the former ridges, that if the soil be dry, it is of little consequence in what direction. All the weed-roots, &c., brought to the surface, are carefully gathered into heaps, and either burnt on the ground, or carried off to form a compost, usually with lime. The land is generally ploughed and harrowed again, if considered necessary, and all the weeds brought to the surface are removed as before. Loose stones, and all obstacles to good tillage, are to be removed.

If the drill culture is intended the land is again ploughed, harrowed and rolled, and any weeds disengaged are collected and taken off. It is then generally well pulverized, and in a fit condition to be formed into drills. If this should not be so, the same operation of ploughing, harrowing, and gathering of weeds is to be repeated, until the ground is cleared of injurious roots, and reduced to a pliable state.* The drills are then formed. The distances vary from twenty-seven to thirty-six inches—thirty inches is a good distance. The intervals should be wide enough to admit of after culture by the cultivator.

* The writer is fully aware that this process will be objected to as too expensive, troublesome and laborious. But all is abundantly made up in the increase of the crop, and more especially in the fine state of improvement in which it leaves the soil.

Manuring. Different kinds of manure, as well as various modes of application, are used. Some spread the manure evenly over the land, before ploughing; others deposit it in the intervals or drills. Of well prepared barn-yard or compost manure, a liberal supply is necessary, as the goodness of the crop will depend upon the fertility communicated to the soil. The manures suitable to the turnip are applicable to all the other root crops. Lime, street-sweepings, sea-weed, bone-dust, plaster, ashes, &c., are all used in the drill system. These are sown in the drills.

Sowing. The old plan of sowing broadcast is now nearly abandoned, and the drill barrow, which is an admirable instrument, is almost universally used in the sowing of root crops. The advantages arising from the use of this implement are, the seeding is performed expeditiously and with great regularity. The land being prepared; as previously described, the machine lays out the drills, drops the seed in the fresh earth, covers, and rolls it down immediately, by which means the seed will generally germinate several days earlier, than when planted in the old way.

The *time of sowing* varies according to circumstances, season and climate. From the middle to the last of July is the usual time; some sow as late as the 12th of August. When sown broadcast, a quart of seed is sufficient for an acre; and when sown in this manner, the field may be passed over by the harrow as soon as the turnips have attained the size of walnuts. Though many of the plants will be displaced, the crop will be vastly benefitted by the operation.* When sown by the drill machine a pint of seed is abundant. It is generally considered that late sown turnips are much the best for the table, and that they are less liable to disease and the ravages of insects, if sown late, than when sown early in the season.

After culture. In the after culture of the turnip, as well as all other root crops, the cultivator cannot be dispensed with. It is, as soon as the young plants show themselves above ground, to be passed along the intervals, pulverizing the earth, and removing the weeds. At the second operation a hand follows with the turnip-hoe, the drills are to be well cleansed and the plants thinned; the proper distance between the plants is eight to twelve inches. The distance between the plants, it should be remembered, must be regulated according to the strength of the land, the time of sowing, and the kind cultivated—strong ground and early sowing, always producing the largest roots. The width of the hoe should be in proportion

* E. P. Roberts, Esq., of Baltimore.

to the medium distance to be left between the plants; and the distance should be according to their expected size. Sometimes the cultivator passes again along the intervals, but more frequently the hand-hoeing, just referred to, concludes the process; the weeds being now kept down by the rapid growth of the plants, and the overshadowing of the intervals by the leaves.

Harvesting is postponed as long as the season will permit. The roots are pulled by hand, laid on the ground, the tops of the two rows facing each other. A hand following with a bill-hook, with a light blow separates the tops from the roots as rapidly as three or four persons can pull them. Three men will, in this way, harvest, of a good crop, three hundred bushels per day.* The tops are gathered into heaps and taken to the barn-yard in carts daily for the stock, until they are consumed.

There are various methods adopted of *storing turnips.* The Genesee Farmer recommends pits to be dug in the field where they are raised, limited to two feet in width, of an indefinite length, and not more than two feet deep. But it is all-important that the soil and sub-soil of the place where the pit is sunk, be light and dry. They may be buried in almost any soil, peculiarly adapted to their culture. The turnips are stored by hand, and require great care, and should terminate in a ridge about eighteen inches above the ground.

The crown of the ridge is then to be pierced with an iron bar, at intervals of about a yard, into which a wisp of straw may be inserted, so as to let off the rarified air; otherwise the roots will heat, and the rarified air not being permitted to escape, the turnips are apt to rot. For want of this precaution many crops have been nearly lost. No danger need be feared from the admission of frost to the roots through these openings. The best way is to store them in barns, or in cellars. They must always be guarded against frost.

Yield. The amount of produce per acre varies according to the soil, good or bad tillage, and other circumstances. Six hundred bushels of the common or English turnip are generally considered as a good crop—but heavier crops are frequently raised. The Farmers' Cabinet, vol. iii. p. 17, gives, on the best authority, eight hundred and fifty-two bushels to the acre. The ruta-baga, with proper care, yields large crops—on an average, and with the same treatment, one-third more than the common turnip. Numerous instances are on record of from twelve to sixteen hundred bushels being raised to the

* Judge Buel. Complete Farmer, p. 266.

acre; these cases have received special attention in the after culture as well as in the preparation of the ground; the drills were about two feet apart. Since the general introduction of the ruta-baga, the cultivation of the common turnip, as a field crop for the use of cattle, has declined. But no good farmer will give up entirely the culture of one for the other, as a change is not only agreeable but beneficial to cattle and sheep.

Use. We all know their value as a table vegetable. The tops serve as food for cattle in autumn; and in winter they are fed to cattle. They are cut by an implement with four blades into as many pieces—other implements are also used. They are excellent for sheep, especially for ewes that have young. They are very nutritious, and excellent for fattening stock. Judge Buel says, "a bullock will thrive fast upon two bushels a day, and will consume hardly any hay, and requires no drink."*

Obtaining varieties. The turnip is sometimes cultivated for its seeds for sowing, and by careful selection varieties of the plant may not only be multiplied, but greatly improved. A manner of procuring a good variety of turnip is to select the largest and best formed turnips, with the smallest tops, and plant them in rows, at a considerable distance from any plants of the same family. They will flower, and when the pods are formed, they are to be guarded against the depredation of birds. When the seeds are matured, the stems are to be cut down and well dried, the seeds separated from the pods, and carefully preserved for future use.

The diseases and accidents to which this plant is subject are very numerous. It is liable to a kind of blight. But its most fatal enemy is the fly. No effectual remedy for either has as yet been discovered. It does not suffer now, however, as much as in years past—and the crops have never been as seriously affected in this country as in England.

The following is a statement from Rev. Henry Colman, one of the first farmers of New England, and at this time Commissioner for Superintending the Agricultural Survey of the State of Massachusetts, of his method of raising the ruta-baga or Swedish turnip.

Gentlemen—Accompanying this you have the certificates of a crop of ruta-baga raised this year (1830) on my farm in Lynn. From these it will appear that on an acre, measured by a sworn surveyor, on one side of the field, there were gathered seven hundred and forty-one baskets full; and that forty baskets of the above named weighed at the town scales two thousand seven hundred and fifty pounds net weight. This, allowing fifty-six pounds to a bushel, the

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* The results of a most interesting experiment in the culture of the common turnip, is very minutely detailed by Mr. Samuel W. Smith. See Appendix B.

standard weight assumed by the society, would give a crop of nine hundred and three bushels to the acre.

The turnips were planted on the 29th of June and 2nd of July; about one pound and a half of seed was used for the acre; and they were gathered and stored in cellars and in the barn in the last part of November.

The ground on which they grew is a good soil, neither wet nor dry, and bore the last year an abundant crop of onions, and corn the year preceding the last. It was well manured at both times, and in fine tilth. It was manured with at least six cords to the acre of barn manure the last spring, and sowed again to onions; but the seed entirely failing, it was ploughed, harrowed, furrows struck out, and about eight cords of barn manure spread in the furrows; ploughed again so as by a back furrow to form a ridge over the manure, and the seed sown with a small drill-harrow on the ridges, making the rows about twenty inches asunder. As soon as the plants were of sufficient size, a drill-harrow, with small shares fixed to it, to cut off all the weeds, was passed through the rows; and the plants thinned with a small weeding hoe to the distance of about eight inches apart, and the vacant places filled up by transplanting from the supernumerary plants. They were once more harrowed and cleaned, which was a very small labour; and owing to the very unpropitious weather, were not harvested until very late. Some of them were very large; one weighed fifteen pounds, and many were nearly as large. The exact expense of cultivating the acre cannot be estimated, as it was intermixed with other farm work; but the whole, from the sowing to the gathering, was not two-thirds of the labour usually bestowed on planting, cultivating, and gathering an acre of potatoes.

My Swedish turnips the last year, of which I raised considerable quantities, were fed off to my oxen, dry cows, young stock, and fatting sheep. To the cattle they were of very great advantage; and for feeding sheep, they proved the last year, by an accurate account, worth from ten to twelve and a half cents per bushel. The man who has the care of my stock considers them as among the most profitable feed which can be given either to fatting or to store cattle. Three years' experiment has increased their value very much for these purposes in my own estimation.

IV. THE ONION.

The common bulbous onion, so highly esteemed among us, is a biennial plant; it is supposed to be a native of Asia. There are a great variety of plants, and many of them may be cultivated as field crops to great advantage. The following account of the mode of culture, &c., we take from the Practical Farmer.

This is a well known vegetable. It has many varieties, distinguished by colour, size, and taste. Of these the red is the largest and most raised. The pale red and the yellow are less in size than the red, and somewhat milder; but the white, though the smallest, are the mildest, the soonest fit for use, and the best for keeping.

This root requires a mellow, dry soil, and the richer the better. The soil may be a rich sand, sandy loam, dry loam, or a gravelly loam; or either of these earths, of common quality, when strongly manured, will answer. It is supposed that well rotted and fermented composts, formed of such materials as are most suitable to the soil, will always be found the best manure for this root. In April, or as soon as the ground is sufficiently dry to pulverize well, make it very fine, but not deep; make the rows a foot apart, and scatter the seed thinly an inch or more deep. Then fill in the drills, and harden the surface with the back of a shovel.

When the plants are two or three inches high, thin them to four or five inches apart. Or make the drills about ten inches apart, each way, and drop six or eight seeds, where the drills intersect each other. Though the largest onions are those that grow singly, some inches apart, those that are more crowded produce larger crops. A small quantity of ashes and sand spread over the ground after planting, is useful. Keep the ground clear of weeds by hoeing and weeding, but do not hoe deep, nor raise earth about the plants. They should be hoed three or four times before the tops have arrived at their full height. After the bulbs begin to swell, hoeing must be discontinued. It is said to be very useful, to apply soot and ashes when the bulbs begin to form. Some are in the practice of beating down the tops, after the roots have attained considerable size, for the purpose of making the latter grow the faster; but the practice is no doubt injurious. When the stalks shrivel and fall spontaneously, they have ceased to grow, and should then be pulled up and laid on the ground some days to dry and harden. If the weather should prove moist, they must be turned, or they will strike new roots and grow. When sufficiently dry, cut off the tops, carry them in and spread them thin over the floor; here let them remain until the commencement of cold weather, then put them into a box or cask with alternate layers of dry chaff or fine straw, and set them in a place where they will not freeze. A little frost, however, will not essentially injure them, unless they are moved while frozen; but it is better to keep them in a temperature a little above the freezing point. Those which are shipped from New England, are usually tied up in wisps of straw, and if they be hung up in this way they will perhaps keep longer than any other. If they incline to sprout, sear the roots with a hot iron, which will stop their growth. Those which have thick necks and the bulbous part small, may be left in the ground during winter. Many of them will stand the frost, and in the spring may be taken up and set in a bed, where they will grow to be good onions. At all events, they are good for nothing, without a second year's growth; and must not be mixed with good onions, lest they cause them to rot.

To obtain seeds from onions, plant them very early in the spring in beds, about nine inches apart. Take the largest and soundest for this purpose, and keep them clear of weeds while growing. When they come to head, tie them loosely to stakes drove down for that purpose; otherwise they will fall to the ground, and then the seeds will not come to perfection. In a garden there always ought to be a crop to succeed seed onions. Onions are not an exhausting crop; and they may be constantly raised on the same ground.

To cultivate onions on a large scale, the ground should be perfectly clear of stones; and if it contain the seed of weeds, these should be first eradicated by a hoed crop. The ploughings, for preparing the land, in the first instance, need not be deeper than three or four inches. If the ground be suitably mellow, any further ploughings, for succeeding crops, will be unnecessary: all that will be found requisite will be, to re-mellow the ground as deeply and effectually as it can be done by a heavy iron-toothed harrow, having the teeth well pointed, and turning forward, so as to run about two inches deep. But, where the ground is not of the mellow kind, it should be prepared as at first. Whatever manure is applied, should be very finely rotted, clear of the seed of weeds, and well mixed with the soil by the harrow. After the surface is finely pulverized, it should be rolled, and then it is fit for the reception of seed.

The sowing should be as early as the ground can be completely prepared. The seeds should be drilled in, in rows about ten or twelve inches apart, by a small hand-drill plough. This machine may be made to drill in two rows at once. The seed should be drilled in pretty thickly, for fear they may not all vegetate. If the plants are too thick, they must be thinned by hand, when the first weeding commences. This is the most laborious operation in the whole process of raising this root, as well as some others; but here we propose another labour-saving implement, in the shape of a small hand-weeding plough. Every part of the interval between the rows should be cut with this plough; after which it would probably be found requisite to use a small narrow iron-toothed rake, for the purpose of completely separating the roots of the weeds from the soil. After this, the cleansing of the rows of the weeds, which the plough could not touch, must be performed by hand. When the weeds begin to rise again, this operation must be repeated, and again, if it be necessary, as no weeds should be suffered to grow among the crop.

By the use of the drill and the weeding-plough, it is believed that one-half of the labour usually bestowed would be saved.

Onions have been successfully cultivated in light, black, swampy grounds, when sufficiently dry, by small open ditches about three rods apart.

V. THE CARROT.

This valuable root is a biennial plant, and is found native in many parts of the world. Of the cultivated carrot there are many sorts distinguished by their colour, size and form. These have not been derived from the wild plant of northern Europe, which no cultivation has hitherto been able to change. It is probably a native of the south of Europe. It has been long cultivated in gardens, as an excellent vegetable. But its great value as food for cattle, was not known until a few years past, and, consequently, its introduction as a field crop is of recent origin.

Soil. The carrot requires a mellow soil, into which, as it is a tap root, it can penetrate freely and deeply; it therefore prefers the sandy and rejects the stiff clays. A fertile sand, a sandy loam, a dry warm loam, or a fertile gravelly loam, are each suitable for the production of a good crop, if properly prepared, well manured, and carefully attended to. The ground ought to be ploughed as deep as possible—well pulverized, and all weeds, stones, and other obstructions removed. If the field should receive a ploughing the preceding fall, it will be all the better for it, as it will be pulverized by the frosts of winter.

Manure, according to some, should not be given to carrots the year they are sown, from an apprehension that when the roots meet with it, they become forked, scabbed and wormy.* This objection, however, will apply only to manures applied in an impregnated state—a liberal application of manure is essential to a good crop; but it should be well rotted and made very fine, so as to offer no obstruction to the downward growth of the plant. If it meets with such obstruction, the root will divide and become forked.

Sowing the seed is performed in three ways. 1. The land may be formed into drills, and the seed sown on the top. 2. In rows, but without being on raised drills. 3. Broadcast. Of these three methods, the best under ordinary circumstances is that of rows, either on a raised or flat surface, and these rows may either have a narrow interval, as twelve or fifteen inches,

* Loudon, page 862. Farmers' Assistant, page 43.

in which case only the hand-hoe can act; or at such a distance that the cultivator may be used as in other crops. Two pounds of seed, when sown in rows, is sufficient for an acre. Broadcast, five pounds. *Caution*—The seed of the carrot should be of the previous season's growth, otherwise they may not vegetate. They should in all cases be tried before they are sown; the most frequent cause of the failure of the carrot being the badness of the seeds.

The *after culture* given to the carrot consists entirely in hoeing and weeding—that is, keeping the soil well pulverized and free from weeds. The first hoeing should be given when the plants are fairly above ground; and the operation must be performed with great care, as it is difficult at this period to distinguish the carrots from the weeds in the rows.

Harvesting or gathering is generally performed in the month of October—they may remain later in the ground if the weather proves mild and favourable. *When stored for preservation during the winter*, different modes are practiced, according to the conveniences possessed by the farmer. A cellar might be easily constructed in a side-hill, covered with earth, and so guarded as to exclude the frost, in which these and other roots designed for feeding cattle could be stored.

Produce and use. The produce depends upon soil, season, method of cultivation, &c. Of late years, since the attention of farmers has been directed to the cultivation of roots, as a source of profit, immense crops of carrots have been raised; as high as eighteen hundred bushels to the acre. The average crop—(we now speak of good farms and good farmers)—is from six to eight hundred bushels. *Use.* The carrot is very nutritious. As food, it is eaten both by man and beast. It is relished by every domestic animal in its raw state; and where the winters are long they are of inestimable value as fodder. For fattening animals, they are most excellent. Animals generally may be almost entirely fattened on carrots.

To save carrot seed, select annually some of the most perfect and best shaped roots in the taking up season, and preserve them in sand in a cellar until the ensuing spring, when they should be set out as early as the season may justify. In August the seed will be fit to gather, and is best preserved on the stalks till wanted. This is a sure mode of obtaining fine seed; but still an occasional change is necessary.

The *diseases* to which the carrot is liable are those common to most plants, such as mildew, insects, &c. The mildew, and worms at the root, frequently injure the crops, and are to be guarded against as far as possible, by a proper choice of soil, season of sowing, and after culture.

VI. THE PARSNEP.

The parsnep is a biennial plant, with a fusiform root like the carrot, which it resembles in its uses and the manner of its cultivation. It is a native of Asia and of many parts of Europe. It has long been cultivated in gardens as a culinary vegetable, but is only of late, and as yet of very limited introduction as a field plant. The parsnep produces a larger crop than the carrot, averaging twenty-four tons to the acre in England.

The best soil is a deep rich sandy loam, or a soil which is sufficiently deep and mellow to enable the root to force its way downwards with ease, as it has a tendency to strike deeply into the earth. It may be cultivated in drills, precisely like the turnip and potato. Indeed this seems to be the best mode of raising it—because an increased deepness, eminently favourable to the habits of the plant, will be given to the soil.

The intervals need be no wider than will admit the cultivator for the after culture of the crop; and the plants in the rows should stand from eight to ten inches from each other. All the after processes of tillage may be the same as for the carrot, as well as the soil, preparation and manure. The plant is ready for use when the leaves begin to decay. It may be taken up and stored like the carrot. The quantity of seed for sowing in drills or rows, is from three to five pounds per acre; broadcast, eight pounds.

Its *uses* for domestic purposes are well known. All animals are fond of it. To milch cows it is eminently favourable, giving a flavour and richness to their milk, which no other winter vegetables but the carrot and sugar-beet can give. Horses are fond of it, and thrive as well upon it as on the carrot. Mr. Loudon says, that thirty perches where the crop is good, will be sufficient to fatten a perfectly lean ox of three or four years old, in the course of three months. Hogs are excessively fond of it; and, when boiled, poultry may be fed upon it to advantage.

Parsnep leaves may be mown off before taking up the roots and given to cows, oxen or horses, by which they are greedily eaten. To save seed, proceed as with the carrot. The parsnep is a hardy plant, and subject but to few diseases or accidents.

VII. THE CABBAGE.

The cultivation of this plant as a garden vegetable, is of the greatest antiquity. The varieties, though numerous, are all derived from the same stock. Its native country is unknown. It is cultivated only for its leaves, which are highly nutritious, and very palatable to both men and cattle—especially cows. The large field cabbage (drum-head) are considered best for farm culture.

Its cultivation as a field crop for the use of cattle, cannot be strongly recommended; as it is inferior for that purpose to the sugar-beet, ruta-baga, and some other more certain crops. Nevertheless every farmer will find it to his advantage to raise a proper portion of cabbage as a change of food for his farm stock. It will have a good effect on the cattle. When fed to milch cows the decayed leaves should be removed with great care, as they impart an unpleasant flavour to the milk. The field culture of the cabbage in the neighbourhood of cities and large towns, may be prosecuted to great advantage.

Any soil that is rich will suit the cabbage, but a strong loam is preferred. The preparation of the land is similar to that for potatoes and turnips. The seed may be either sown in drills—the shoots being afterwards singled out to the requisite distance, and the roots allowed to stand for a crop—or they may be sown in a garden or nursery, and afterwards transplanted. This is the plan usually adopted. The *season for sowing* depends upon the time when it is intended to make use of the crop. They will thrive if planted any time from March to June.

The intervals between the rows are tilled by the hand-hoe and cultivator, as described in the case of the turnip. The last tillage should be that of earthing up the soil thoroughly to the roots of the plants. The drills should be thirty to thirty-six inches from centre to centre, and the distance between each plant in the rows should be two and a half feet. But these distances are for the very largest kinds. Cabbages do not endure storing like turnips. They are liable to fewer diseases than almost any other plant cultivated.

There are many excellent varieties easily grown, very delicate, sell readily, and may without difficulty be preserved during winter. The Savoy cabbage, which is in good repute, requires a distance of two feet in the drill—the distance between the drills, from centre to centre, being the same. An acre of land contains four thousand three hundred and ten square yards, equal to forty-three thousand five hundred and sixty square feet—consequently ten thousand eight hundred and ninety Savoy cabbages may be raised on an acre of ground two feet apart each way.

VIII. RAPE.

The *Brassica Napus*, cole or rape, is a native of Great Britain; a biennial plant of the turnip kind, with a caulescent or woody fusiform root, unfit to be eaten by animals. Its leaves are smooth. When cultivated it produces abundance of leaves and seeds. The leaves are used for food; and from the seeds, an oil of very superior quality, and extensively used in the arts, is expressed.* A bushel of the seed will generally give a gallon of oil; and the cake from which the oil is expressed affords a rich food for cattle, and when powdered or pulverized is extensively used in France, the Netherlands, and England as a manure for drilled turnips.

This plant thrives on almost any soil, provided it is made sufficiently rich; but those best suited for it, and on which it flourishes best, are the deep, rich, dry and kindly soils. It is a hardy plant. It requires less of culture and manure than the turnip, and consequently can be produced under circumstances in which the turnip cannot be profitably cultivated. The manner of cultivating the rape is similar to the manner of cultivating the turnip; but it admits of variations suited to the soil, the period of sowing, and other circumstances.

The preparation of the land and its formation into drills, the manuring and sowing of the seed, is the same as is described for the turnip culture, but with narrower intervals between the rows; the least distance that will admit a cultivator, will answer—say two feet. The quantity of seed depends upon the manner of sowing it. If it is sown broadcast, as is frequently the case, four quarts at least will be required—if by the drill process, one half that quantity will be found to answer. Sow in June or July, when intended for green food

* One peculiar property in the oil of this plant is, that it does not produce spontaneous combustion. Hence, in England and France, it is used in nearly all machinery and manufactures. It is superior to most oils also in other respects. The imports of this oil into this country varies from thirty to fifty thousand dollars per annum. The cultivation of rape and the manufacture of the oil in this country, would not only retain this amount of money among our farmers, but no doubt its general use in manufactories would save many of them from the flames said to be kindled by the incendiary.

in the fall; but in August or September, when the object is to produce seeds the ensuing year. Its *after culture* is the same as the turnip, and consists in hoeing, thinning, and keeping the soil mellow.

It produces in ordinary seasons on rich alluvial, or other deep friable soils, from forty to seventy bushels of seeds, determined in quantity very much by the accuracy of tillage, and the condition and nature of the land. Great care and precision are necessary in harvesting the seeds in June or July of the year succeeding that in which they are sown. When the pods assume a brownish cast, and some of the seeds become black, the crop is reaped with sickles—laid regularly in handsful or *grips* in rows, where it continues until the straw becomes somewhat white—the seeds of the colour of which we find them in the shops.—*John Hare Powell's Hints to American Husbandmen.*

In harvesting rape great care is requisite not to lose the seed by shaking, chaffing or exposure to high winds or rains. If the pods are too dry the seeds escape at the least motion. It should be reaped in fine weather, and immediately threshed out. The seed, as it is liable to heat at first, should not be suffered to remain in large heaps on the threshing floor, but divided into small parcels and frequently turned.

The *uses* to which the rape is applied, are as follow: The seeds are crushed for an oil well known and extensively used. It is used as food for caged birds. The seed, as before observed, after the oil has been expressed, is used with great advantage; first, as a nourishing and very agreeable food for cattle, on which they thrive and fatten remarkably well; and secondly, as a manure for turnips and other root crops, when sown on the drill system. For this purpose it is reduced to a powder. Its leaves as a green food are scarcely surpassed by any other vegetable—sheep and neat cattle are extravagantly fond of them.

IX. THE BEET.

The Mangold-Wurtzel—The Sugar-Beet.

THE *field-beet*, BETA VULGARIS, is of larger size and grows more above ground than the varieties cultivated in the gardens. It is sometimes red externally and yellowish-white internally; but it has different shades of colour. The mangold-wurtzel, or root of scarcity as it was formerly called, is said by Professor VON THAER, to be a mongrel, between the red and the white beet. The mangold-wurtzel and the sugar-beet, as field crops, are of recent date—the latter especially.

The beet, in a good season, sown on a kind soil, and with judicious and careful tillage, will yield an immense crop. The mode of culture throughout, of the mangold-wurtzel and the sugar-beet, is precisely similar. The former is now very extensively cultivated in some sections of England, as a field crop, where they are in high repute for the fattening of cattle and the feeding of milch cows. In the United States they are both in high favour with many farmers, especially the sugar-beet, which contains a large proportion of saccharine matter, and has been found, for all the purposes of its culture, decidedly superior to any of the other root crops.

Chaptal,* the best authority perhaps extant, authorized by ten or twelve successive years of experiments and observations on the culture of the beet, recommends it strongly to the notice of his countrymen, not only as a means of supplying the immense empire of France with sugar extracted from the root, but as preparing the way for an improved state of husbandry; not merely by leaving the lands on which the roots are grown, in a most excellent state for succeeding grain crops, but also by enabling the farmer to keep a large amount of cattle in the best order—which in all cases give him a good return—and leaves him in possession of an abundance of manure.

Choice of soils. Distinction in the choice of soils for the culture of this root is exceedingly important. Its nature is to penetrate low into the ground, and, therefore, prefers a deep loose mould in which it can vegetate without obstacle. Its radicles easily collect the nourishment necessary for its support, and it thrives luxuriantly.† All grain lands are more or less adapted to the cultivation of beets, but the best soils for the purpose are those that have the greatest depth of vegetable mould.

They may be cultivated with good success upon natural or artificial grass lands, but they come up badly when sown in the spring upon such lands as are broken up in the preceding autumn, the turf and roots do not in so short a time become sufficiently decomposed, and in order to have good beet-roots it is necessary to raise a crop of oats between the time of breaking up a meadow and sowing it with beet-seed, after this two successive crops of the finest beets may be grown. Dry, calcareous and light soils are but little suited to the culture of this root, nor will it flourish well in strong clayey soils.‡

* John Antony Chaptal, Count and Peer of the realm of France, who died, July 29, 1833, in the 76th year of his age—full of years and honours—was the father of the beet culture in France, and the able and enlightened advocate of the extraction of sugar from the roots. He was, in the fullest sense of the word, a practical and scientific agriculturist.

† Notice of the Sugar-Beet, page 20.

‡ Chaptal's Agricultural Chemistry, page 317.

Situation of the ground. The position of the ground employed for this culture is not a matter of indifference. In highland the beet succeeds but imperfectly in dry seasons, but it is then easily worked; the crops on these high grounds are abundant in wet seasons. In low marsh grounds the case is reversed, the crop is drowned, and the beet generally saturated with water, whilst in warm dry years the crops are excellent, because the heat and drought are counteracted by the fresh and moist sub-soil. To obtain average crops it is, therefore, prudent when it can be done, to choose a situation exposed to neither of these extremes.

Preparation of the soil. Generally speaking I cultivate beets upon all such lands as are appropriated for sowing grain upon in the fall. The lands I prepare for receiving the seed by three good tillings, two of which are performed in the winter, and one in the spring; (in this county one ploughing in the fall, and two or more, if necessary, in the spring, may be given;) by this last ploughing the dung which is thrown upon the ground after the second is mixed with it, the quantity of manure employed is the same as if the ground was to be immediately sown with wheat.* The importance of thorough ploughing, harrowing, rolling, and all other means of improving soils is now pretty well understood. All plants do not require in the same degree these precautions, and those which require them *least* generally rank among *exhausting* plants, while those that can least dispense with them are considered *fertilizing*. The beet is of this latter description, and one of the leading advantages which it offers to agriculture is the necessity it creates not only for deep and thorough ploughings, but moreover the careful culture it requires, and the means necessary to gather it, must, in the aggregate, necessarily leave the soil in a highly improved state, and the benefits therefore to rural economy which an extensive culture of this plant must produce are incalculable.

Sowing the seed. The period of sowing the beet will depend in some measure upon the state of the season, the nature of the soil, and the situation of the ground on which the crop is to be raised. Early sowing is strongly recommended by some very judicious cultivators; but the sudden return of frosts in early spring—even after many days of pleasant weather—renders very early sowing somewhat hazardous. In this latitude, 40°, from the middle of April to the middle of May, will probably be found in general the most suitable period. Before planting, pour water moderately warm over the seed, and let it soak one or two days.

* CHAPTAL's Agricultural Chemistry, page 317.

It does not answer to sow immediately after the cessation of frosts, as the ground being cold and wet, the seed does not germinate immediately, and the soil becoming hardened by the violence of the rains, does not admit the air to penetrate, so that if the seed do not decay, the beets come up badly. The most favourable period for sowing is that when the earth, although heated by the rays of the sun, still contains sufficient moisture to produce germination and to facilitate the growth of the young plant; the month of April and the early part of May generally unite these advantages.

Choice of seeds. CHAPTAL says that every good farmer always raises his own seeds. In order to do this, he plants his beet-roots, which it is supposed he selects with great care, choosing the finest and most perfectly formed, in the spring, in a good soil, and gathers the seed in September, as fast as it ripens, selecting only the best, and leaving upon the stalks such as are not thoroughly ripe; each beet-root will furnish from five to ten ounces of seeds. When no care is taken in selecting the seeds, and they are sown indiscriminately, not only are many of the beets small and ill-grown, but half of the seeds sown do not yield any thing. The seeds should be fresh, not exceeding two years old, and the utmost care should be taken to know that they are of the true kind.

The seed may be sown in either of the three following methods. 1. In a seed plot. 2. In drills. 3. Broadcast. For field crops, the first and third methods are very objectionable. The true plan is to plant in drills or rows, the land having been previously well prepared; ten to twelve acres may be planted with great regularity in a day, by the use of the drill machine. From three to four pounds of seed are sufficient to plant an acre.

The drills should be from twenty-four to thirty inches from centre to centre; or so wide at least, as to admit the cultivator or horse-hoe in the intervals, which should be used as soon as the plants are fully above ground. The hand-hoers with the turnip-hoe should then follow, remove all the remaining weeds, and at the same time thin out the plants in the rows, to the distance of eight, ten or twelve inches. When the weeds again make their appearance, the cultivator is to be passed between the rows, cutting up the weeds and loosening the earth. The next process, which completes the summer culture of the beet, is the setting up of the earth around the roots.

Harvesting and Preserving the Sugar Beet. The roots are generally gathered in September or October, about the time the largest of the leaves begin to assume a yellowish tinge, and certainly before the setting in of frosts. The remaining leaves may be fed to cattle, having been previously separated from the root, but in such a manner as not to injure its crown. They should not be harvested immediately after long rains. The best, most economical, convenient and effectual mode of preserving the beet, and indeed all other root crops, is in cellars attached to barns, properly constructed and well ventilated; and for this purpose every farmer when about to construct a barn, should fix on a site where, with but little additional expense, he may run off a suit of cellars. The most general mode now adopted for their preservation, is the same as described for the preservation of the turnip. It is, however, both inconvenient and uncertain.

Benjamin Webb, Esq., of Wilmington, Delaware, says, that for the last two years he has cultivated the Silician sugar-beet—yield about eight hundred bushels per acre—the ruta-baga rather more. Expense of raising the sugar-beet, the mangold-wurtzel or ruta-baga, according to his experiments, when compared with corn, as three to one. That is, one acre of roots, properly cultivated, will cost as much as the culture of three acres of corn. The advantage however, is altogether on the side of the root crop—the produce being ten-fold—producing nine hundred bushels of the ruta-baga to the acre; whereas the same ground would not yield over eighty bushels of corn to the acre.

The same intelligent gentleman—who is one of our most careful and observing farmers—considers the sugar-beet preferable to the ruta-baga for dairy cows; but that preference cannot induce him—and in this there is a strong example for others—to cultivate the beet to the exclusion of the turnip. These two roots are planted, and of course cultivated at different seasons, which divides the labour both in planting and dressing, an object with the farmer in the summer season, when every moment of time is of the greatest value. Mr. Webb very judiciously observes—"My experiments warrant no conclusion like making the sugar-beet or any of the root family an *entire substitute* for grain in feeding stock." He recommends roots as most important auxiliaries in the economy of food. To a yoke of working oxen he gives one bushel roots per day, with grass, hay or straw. His winter allowance for a dairy of twenty cows is, from ten to fifteen bushels of roots, and from one to three bushels of chopped corn or oats per day, with as much hay and straw as they can eat.

J. N., a successful farmer residing in Delaware county, and who has been in the habit for many years past of fattening mutton for the Philadelphia market, has used, since 1837, the sugar-beet mainly, with a small portion of corn. The animals fatten on it with great rapidity. It imparts a richness and flavour to the meat which corn fed animals never possess. The consequence is, that his mutton has acquired a high repute, is quickly sold, and at a considerable advance over the corn or grain fed mutton, which is an additional gain over that acquired in the difference of feed.

Yield. We have before remarked, that from the beet, in a favourable season, on a good soil and proper cultivation, very large returns are occasionally obtained. In France, the average is reckoned at fifteen tons per acre. In this country, with the same careful tillage, the average would, no doubt, double that of France. It does not, probably, at the present time, fall below twenty-five tons to the acre. But it should be recollected that here the roots grow to a much greater size than in Europe.* William Andenreid, Esq., of Schuylkill county, Pennsylvania, raised in the year 1835, of the sugar-beet, the enormous crop of sixty-two and a half tons to the acre. John Sanford, of Marcellus, New York, has raised, according to the Genesee Farmer, two thousand bushels to the acre. These are uncommon crops. The usual yield, where soil and all other circumstances are favourable to the growth of the plant, is from eight hundred to one thousand bushels to the acre.

X. THE JERUSALEM ARTICHOKE.

This plant is, like all the plants of the sunflower genus, a native of America; and notwithstanding it belongs to our southern section, it is one of the hardiest of our cultivated plants, very productive, easily propagated, and growing on the poorest soils. Its stems vary from five to ten feet in height. It may be propagated with the greatest ease from tubers, like the potato—or from its seeds. It grows rapidly, and may be cultivated like the potato; but the intervals between both the plants and rows should be larger. It may be planted in autumn; but if planted in the spring, it will be ready for use in September.

It is customary, with some who grow this plant, to cut the stems or stalks even in July, to prevent their falling down; and, on the continent of Europe, the stems and leaves are used as green and dried fodder for cattle; but we believe this practice has not as yet been introduced into England. The tubers

* James Pedder, Esq.

are in clusters, attached to the roots of the plant. As compared with the tubers of the potato, they are watery, and inferior in nutritive properties. Still it is considered valuable for feeding hogs and other animals; the tubers are generally eaten with great eagerness. This plant is in a peculiar manner fitted to grow under the shade.

The yield is frequently very large—about five hundred bushels per acre having been produced without manure. The "Complete Practical Farmer," page 145, says, that one cultivator obtained between seventy and eighty tons of this root; and expresses an opinion that three acres devoted to this culture will keep one hundred swine for six months. It is a certain crop and suffers little if any from frost. Taking therefore into account the hardy qualities of this plant—its productiveness and easy culture—it may be doubted whether it merits the almost universal neglect into which it has fallen. Granting its inferiority as an article of food to the plants now cultivated for our domestic stock, it must be of some importance to retain among us, a plant that can be so easily raised, and on soils so low in the scale of fertility.

VIII.—PLANTS CULTIVATED FOR THEIR FIBRES FOR THREAD, OR CHIEFLY FOR THE CLOTHING ARTS.

I. FLAX.

The plants chiefly cultivated for their fibres for thread and the clothing arts, are *Flax*, *Hemp*, and in the southern states, *Cotton*, on a very extensive scale, teasel, madder, woad and weld; the first four are used by the manufacturer of the fabric, and the others by the dyer. Flax is cultivated for its fibre for thread, and also for its seeds for being crushed for oil. It is supposed by many writers to be a native of Egypt, but Mr. Armstrong says it is of Asiatic origin*—it has been cultivated from time immemorial. It is a hardy plant, embracing a wide range of temperature, being cultivated, and for the like purposes, from Egypt almost to the polar circle.

Flax is considered an exhauster of the soil and farm, especially when its seeds are permitted to arrive at maturity; but its effects are less injurious when pulled green, in which respect it follows the general law of other cultivated plants. The soils best suited to it are the rich alluvial districts—where it should be largely cultivated—entering into, and forming a part of the regular course of crops. In such districts its culture, with proper care in keeping the land clean, and in its fertile state, would be found highly profitable both in an individual and national point of view.

The soils most proper for flax, besides the alluvial kinds referred to in the preceding paragraph, are deep and friable loams, and such as contain a large proportion of vegetable matter in their composition. Strong clays do not answer well, nor soils of a gravelly, or dry sandy nature. But whatever is the kind of soil, it ought neither to be in too poor nor too rich a condition; because, in the latter case, the flax is apt to grow too luxuriantly, and to produce a coarse sort; and, in the former case, the plant, from growing weakly, affords only a small produce.†

The following very judicious remarks on the culture of flax,

* See Armstrong's valuable and interesting Treatise on Agriculture; section x. article 8.

† Treatise on Rural Affairs.

are gathered from an Essay on Flax Husbandry, by S. W. Pomeroy, Esq., of Brighton, Massachusetts. This essay is filled with practical information. The author very correctly remarks in the introduction, that flax, though a necessary crop, has never, at any period, been considered as a profitable one with us. But it is presumed that such has been the acquisition of knowledge and improvements, especially in those branches of mechanical knowledge connected with it, that an entire new view may be taken of flax husbandry—that it may be made to enter into the agricultural system of the country much more extensively than heretofore.

Notwithstanding it is an opinion well established among experienced flax-growers in this country, that a change of seed is advantageous, it is apprehended that they are not aware of the extent of the benefit to be derived by selecting seed from a soil or climate essentially different; and it may be owing to a want of attention in this particular, that the flax crops are so uncertain, and the quality inferior, however perfect in other respects the system may be conducted.

Mr. Young observes, that "foreign flaxseed was universally used in Ireland when it could be obtained, otherwise they were careful to procure seed which grew upon a soil of an opposite quality from that which was to be sown;" that "American seed was preferred, and produced finer flax than any other. Baltic seed produced more, but of a coarser quality." It is well known that American seed always bears the highest price in the Irish market.

We next look to Flanders, where flax was cultivated at a period as early as the commencement of the Christian era.* Fortunately we are furnished with "Directions for Cultivating Flax after the Flanders Method," published by commissioners and trustees appointed by the British government, to promote the linen trade in Scotland, at the head of whom was the celebrated Lord Kaimes. From this high authority we find that it was the practice to sow seed from Riga, if it could be obtained, otherwise the produce of Riga seed sown in Holland, and if that could not be had, that which Riga seed had produced in their own country—being careful to choose that which had grown on soils of a different texture and quality.

What is the practice in Germany, where the cultivation is very extensive? By a respectable British publication now before me, in which an account is given of the trade of Stettin, a city of Prussian Pomerania, situated near the mouth of the river Oder, it appears that the extent of the linen trade is estimated by the quantity of flaxseed *imported;* and it is stated, that on an average of ten years preceding 1796, twenty-one thousand six hundred and forty-five tons of flaxseed were annually imported into that port to be sent up the Oder, and the waters connected with it, which, at forty bushels to the ton, amounts to upwards of eight hundred thousand bushels! sufficient for half a million of acres at the rate it is sown in this country! and it is not improbable that large quantities are imported into other ports connected with the large German rivers.

Foreign flaxseed was sought after even in the remote valleys of Switzerland, as appears by the following extract from a treatise on the culture of flax, by M. Tschiffeli, president of the Economical Society of Berne. "In general, the best flaxseed is produced on strong soils and in cold climates. Experience has long convinced us, that what is brought from Livonia, (Riga seed,) is to be preferred to all others, but when this cannot be procured, we must make use of that which grows on our own mountains, for instance, Gessenaria, Jura," &c.

A Flemish colony first settled the island of Fayal, and introduced flax. They have become amalgamated with the Portuguese, but the culture and manufac-

* Pliny's Natural History, book 19.

ture of linen in families has continued to an extent nearly equal to the clothing and general consumption of a very dense population. The soil is mostly in tillage, and from its elevation admits of a variety of aspect and temperature, and great care is bestowed on the culture of flax. I have been informed by Mr. Dabney, the late United States consul for the Azores, who has resided fifteen years at Fayal, that in several instances American seed, obtained from ships bound to Ireland, arriving in distress, has been sown; and the product in *flax* and *seed* has been fifty per cent. more than that of native growth by the side of it! We have no information to this point from Russia or Italy—but it is believed that examples enough have been cited to show the importance attached to this branch of the system in Europe, and to justify the conclusion, that in this country, a continued, judicious change of seed will be indispensable to the successful prosecution of flax husbandry; and a further inference may be drawn, that experiments on various soils, with seed the growth of different climates, are requisite to direct the farmer to the quarter from whence his best seed may be obtained. Here opens a legitimate field for our numerous agricultural societies to labour in; on their exertions the farmer must depend in the outset; but let it once be ascertained that Riga seed is best in one section, Dutch or German in others, and mercantile *interest*, if not patriotism, will soon distribute them.

Soils. The soils which rank first in this country, are the fat bottoms, that are covered by the fall and spring floods, which subside early enough in the season to get in a crop; those river flats on the second banks that have a depth of strong alluvial soil; the reclaimed marshes and swamps, with a black unctious soil, not too peaty, with as much clay in the composition as will permit its being rendered soon dry and mellow, and not retain water on or near the surface; if it stands two feet below, so much the better, but it must be well guarded by ditches and dykes against sudden freshets. Such is the soil of the province of Zealand, where more flax is raised, and of better quality than in any other part of Holland. The next in estimation are the strong black loams on clay, or hard pan that will retain moisture. Yellow loams, with a holding sub-soil, may be rendered suitable for flax, by proper cultivation; and since the discovery that plaster of paris is an excellent manure for it, a crop may be obtained with much more certainty on lighter lands than formerly. Perhaps the characteristic of best *garden mould* may be applied to a flax soil, viz: *retaining sufficient moisture, and all that falls, without ever being saturated;* but on any soils the surface should be completely pulverized, and never worked when wet.

Manures. No dung should be applied to the land when the flax is sown, but it may be put on bountifully with the previous crop. The objection is, that dung forces the growth so rapidly, that the plants draw up weak, have a thin harle, and are more liable to lodge. Lime, marl, shells, leached ashes, &c., do not produce such effects. Top dressings, soon after the plants appear, of plaster, ashes, soot, &c., are highly beneficial, as they not only encourage the growth, but are a protection against worms, which sometimes attack the young plants, and may be considered the only enemy they have, except weeds. Salt has been mentioned by the late Dr. Eliot, of Connecticut, as an excellent manure to plough in with flax, at the rate of five bushels to the acre;* probably more would be better. Plaster is now much used in Dutchess county, the best cultivated district in New York, as a manure for flax, on which its good effects are as apparent as on corn. The late Chancellor Livingston viewed a piece of flax on the 20th of May, 1791, belonging to a poor tenant, very injudiciously sown on a dry sandy declivity, it looked so extremely sickly, that the tenant thought of ploughing it up; the Chancellor gave him three bushels of plaister, which was sown the next morning before the dew was off, and had the satisfaction of seeing his tenant gather more flax from this half acre, in an uncommon dry season, than was produced from any acre in the neighbourhood.†

Preparation of the land. It is not unfrequent in Ireland to obtain crops of flax from greensward, on which they put lime, shells, limestone, gravel, &c.,

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* See Eliot's Essays on Field Husbandry.
† Transactions of the Agricultural Society of New York.

and harrowing fine in the spring—but it most commonly succeeds a crop of potatoes which receive the manure. In Flanders, hemp was formerly more used as a preparation for flax, than since the introduction of potatoes. In Italy it commonly precedes flax, and although the land gets no tillage, as the hemp is well manured, it grows strong, and is then a powerful destroyer of weeds. In England, on some of the *fen soils* of Lincolnshire, &c., the usual course is hemp two or three years in succession, well manured, then flax without manure—a crop of turnips is often taken the same season after the flax, and hemp succeeds again. In Russia it is stated that extensive crops of flax are drawn from new cleared lands, after burning them over, and harrowing in the seed with the ashes. The best preparatory crops in this country, at present, appear to be potatoes, corn and roots; they will most generally repay the extra manure, and if well managed, check the production of weeds.

The following rotations may serve as an outline, subject to be varied, and hemp or other crops introduced, as circumstances may require, viz.

No. I. *Low, cold, or reclaimed soils.*

1st year. Potatoes.
2d do. *Flax* with seeds.
3d do. Herds grass, (timothy,) and red top, or tall meadow oat grass, to continue three years or more, and the course repeated.

No. II. *Strong uplands.*

1st year. Potatoes or corn.
2d do. Corn or roots.
3d do. *Flax* with seeds.
4th do. Clover.
5th do. Orchard grass or timothy, to continue three years or more.

No. III. *Light lands.*

1st year. Potatoes or corn.
2d do. Corn or roots.
3d do. *Flax* with clover seed.
4th do. Clover to be mown once, the after growth to be turned in, and rye sown thick on the furrow, which may be soiled or fed in the spring by sheep or milch cows, and ploughed in for
5th year. Corn.
6th do. Spring wheat or barley.
7th do. Clover, and the course to be pursued as before, when flax will occupy the ground every seventh year. In all cases, except when hemp is substituted, the tillage crops should receive the dung.

If the land is ploughed into beds, or convex ridges, like turnpike roads, about a rod wide, especially if low and level, the crop will be much more secure from injury by heavy rains, and the grass crops will be better if it remains in that form. On any soils, fall ploughing in narrow ridges will facilitate its early working in the spring, and should not be dispensed with.

Weeding is considered in Europe, and by good husbandmen in this country, as necessary to secure a good crop of flax, which is a very tender plant when young, and more easily checked in its progress by weeds than any other. It is not supposed to be injured by the clover and grass sown with it; on the contrary, the Flemish farmers think them beneficial, by protecting the tender roots from drought, and keeping the weeds under. It should be carefully wed when the plants are three or four inches high; they are not then injured by the labourer going barefooted over them.

Choice of seed. That of the last year's growth should be obtained if possible. The usual marks of good seed are, that it be plump, oily and heavy, of a bright brown colour, sinking readily in water, and when thrown into the fire to *crackle* and *blaze* quick. A very simple method of trial is to sprinkle it thin between two pieces of wet paper, which plunge in a hotbed or dunghill, and in less than twenty-four hours the proportion that will vegetate can be discerned, which should be ascertained in order to regulate the

Quantity to be sown. On this head no particular directions can be given, as it depends on the various qualities of soil, goodness of seed, &c. The rule for seeding small grain is reversed; flax requiring to be sown thickest on rich soil, as not more than one stalk is wanted from a plant. In England and Scotland, never less than two, or more than three bushels to the acre is sown. Two and a half is the most usual portion. In Flanders and Ireland, seldom less than three bushels are sown, except when seed is an object. Thick sowing is to obtain fine flax. In this country, it will be important at present to sow at such a rate as will insure good crops of each; and experience only can determine the exact point.

If sown very thin, too many lateral branches will be thrown out; each producing a boll, or pod, affording more seed, but shorter and inferior flax. If sown too thick, the plants will draw up weak, with a single boll on a plant, and subject as our climate is, to heavy showers and thunder gusts, very liable to lodge; one of the greatest dangers a flax crop has to encounter. The commissioners for promoting flax culture in Scotland, considered it as practicable, and strongly recommended that the system should be so conducted as to obtain good flax and good seed at the same time. It is so viewed in Ireland, among the more extensive cultivators, except when wanted for fine linen, cambric, lawn, &c. Dr. Deane recommends from six to seven pecks. It is probable that six pecks is the least and two bushels the extent that should be sown, to obtain the most profitable results.

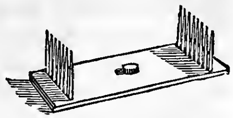
Sowing. The seed should be got in as early as it is possible to prepare the ground. Dr. Deane observes, that a slight frost after the plants are up will not injure them. For no crop is it more important that the seed should be equally distributed. Fortunately, what has long been a desideratum is now attained. A machine for sowing small seeds broadcast with perfect regularity, great expedition, and in any desired quantity, has lately been invented, and performs to great satisfaction.

Pulling. This should be performed as soon as the leaves begin to fall, and the stalks show a bright yellow colour, and when the bolls are turned a little brown. The seed will continue to ripen afterwards. When the flax is lodged, it should be pulled immediately, in any stage of its growth, or it will be entirely lost; great care is requisite in sorting the different lengths, and keeping them separate until after the flax is hackled, or much waste will ensue in that process.

Saving seed. As soon as the flax is dry enough to be put under cover, the bolls should be *rippled*, as it is termed. By this method the foul seeds are separated with little trouble, and good clean seed is ready for an early market, often the best, without the use of expensive machinery to make it so. Here the operations of the farmer ought to end. The process of preparation being foreign to, and unconnected with his other pursuits, and which has been the greatest objection to flax culture. Can there be any reason why the farmer is to prepare his flax, more than the hides of his cattle which he sends to the tanner? They are both chemical processes; and to dissolve the glutinous or resinous substances by which the fibres are attached to the stem, without impairing their strength, is perhaps as critical, and requires as much care and judgment, as to extract the animal juices from the hides and fill the pores with tannin. In short the flax-grower, and flax-preparer and dresser, should be distinct professions. They are so in France, Flanders and Holland, and were extensively so in Scotland, where the farmer sold his flax on the ground, or in sheaves at his barn or rick.

Preparation of the Flax. This article cannot be complete without a brief account of the method usually adopted for the preparation of the flax. It will be interesting to new beginners and those who may possibly devote a few acres to its culture. When the crop is ready, the plants are pulled up by the roots and laid in handsful alternately crossing one another, and left upon the ground for a few days to wither. They are then freed from the capsules or seed-vessels, made into small sheaves, which are conveniently tied by a few stems of the plant or rushes.

The separation of the seed-vessels from the stems is performed by a process termed rippling. The rippling machine is an implement somewhat like a comb, with iron teeth fixed upon a plank. Through these teeth the stems are repeatedly drawn by hand, and thus the capsules or seed-vessels are separated. The ripple is placed in the middle of a large sheet of canvass spread



upon the ground. There may be two sets of teeth, as shown in the figure fixed on one plank, so that two persons may work at the same time; and the plank may be conveniently fixed in the ground by a pin passed through it. The capsules are preserved, the seeds being either used for sowing or bruised for oil. It is at this point that Mr. Pomeroy very justly observes, that the labour of the farmer should cease.

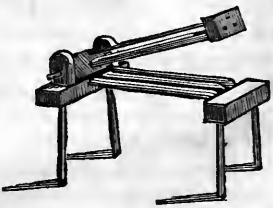
The next process is to separate the fibres from the stem. The common method of doing this is by steeping the whole plant in water. By this means the softer parts of the stem partially undergo the putrefactive fermentation, while the tougher fibres of the bark are not affected. At a certain period then, as ten or twelve days before the fibrous part of the bark has become affected, the plants are removed from the water and dried. After being dried the stems become brittle, and are easily separated by rubbing or beating from the fibrous part of the bark, which is the only part employed in the manufacture of linen. It will appear that, if the putrefactive process shall proceed too far, the fibrous, as well as the mucilaginous, part of the bark may be affected.

It is, therefore, a point of practice, to allow the putrefactive process to proceed just the length of affecting the softer part of the stem, without acting upon the fibrous part of the bark. And the usual manner of performing the process of steeping is the following:—The little sheaves made up after the process of rippling, are carried away to a pool or tank containing water, or into which water may be conveyed—and in all cases the water ought to be clear and soft. The sheaves should be placed in the pool in a nearly upright position, the heads of them being uppermost. They are then kept under water by stones or other heavy substances, in such manner as to prevent their rising to the surface. They must not, however, be compressed to the bottom, but merely so loaded as that they shall be kept below water.

The period that flax ought to remain in the water depends on a great variety of circumstances; as, the state of ripeness in which it was pulled, the quality and temperature of the water. The period of steeping to the proper point must, therefore, be carefully watched. In warm weather eight days will sometimes suffice; while in other cases ten or twelve are required. It should be frequently examined with great care after the sixth or seventh day. *It is safer to steep it too short a period, than ever so little too long.* In the first case, merely a little more time is required in the future processes; in the second, the strength and texture of the fibres may be seriously injured.

When the flax is found to be sufficiently steeped, it is removed from the pool, sheaf by sheaf, and laid in heaps near the watering-place, until the water has drained off. It is then to be carried away to a dry and airy grass-plot. Here the sheaves are opened out, and spread evenly and thinly in rows upon the ground, the spreaders working backwards, and causing the butt ends of one row to touch or overlap the tops of the next, with a view to prevent as much as possible its being torn up and scattered by the winds. In this way the whole plot of ground is covered with a thin coating of flax. In this state it remains for a time, determined by the state of the weather, generally ten or twelve days, sometimes more.

During the further process of *rotting*, or *dew-rotting* as it is termed, the dissolution of the soft part of the stem is still further promoted, and the whole becomes hard. When it has lain for a sufficient time, which is known by its being brittle when rubbed, and when it is at the same time sufficiently dry, it is bound up again into sheaves, but larger than those made before the watering process. It is allowed to remain in these sheaves a sufficient time to dry, after which it is carried home. Professor Low thinks the operations of the grower of flax terminates *here*, and that the remaining parts of preparation are properly the province of the manufacturer. But sometimes the manufacture proceeds on the farm itself to the extent of partially separating the fibrous part.



The dressing of flax, which is the next process, consists of various operations—the most common is breaking the stems by an instrument called a *break*. This machine consists of three triangular planks fixed together at both ends. Two triangular planks are fixed to another frame. The two frames are fixed together at one end by a hinge, and work the one into the other as in figure.

The upper moveable frame being lifted up, handsful of flax held in one hand are placed upon the lower frame, while with the other hand the upper frame is made to work upon the flax by repeated strokes. In this manner the flax is bruised, and put into a state to have the ligneous refuse separated from the fibrous parts by beating or scutching, which may be performed either by machinery or by manual labour. When by the latter, the flax is suspended by one hand over a plank, and beat by a flat piece of wood held in the other hand. The whole process is tedious and laborious; but the inventive genius of our countrymen bids fair to overcome these objections. Machines having been invented not only to prepare it, but to *pull it in the field.*

One of the greatest difficulties that has interposed with many against the raising of flax, was the great difficulty and labour of pulling it; being regarded as one of the most severe and laborious operations of the farm. But this difficulty is in a fair way of being surmounted, if, indeed, it is not already overcome, by the invention of a Flax Pulling Machine, by a citizen of Hunterdon county, New Jersey. Of this implement, we can say nothing from personal knowledge or observation, as we have not yet seen it. But it has been tried by many of the first farmers in Hunterdon and the adjacent counties, who cordially recommend it as performing its work as perfectly as can be done by hand, and pulling many acres in a day. It is drawn by horses.

To complete the process, and to get the fibres suited into lengths so as to be fitted for spinning, the lint goes to a class of persons whose province it is to give it this final preparation. These are termed *hecklers.* The heckler operates by means of a set of numerous teeth, placed vertically upon a board. The flax is pulled repeatedly through these teeth by the hand. In this way, and by using heckles of different sets of teeth, the workman sorts the lint into lengths. The refuse after this operation is tow.

The produce of the flax in fibre, varies greatly with the season, soil and management. In Europe, eight hundred pounds to the acre are frequently obtained; but then very little seed is obtained. We can form no opinion as to the probable average of the crop in this country—but it is not so great as in Europe. The best cultivators of flax in Europe are the Flemings, among whom the linen manufacture took early root, and who have ever since pursued the culture of flax with diligence and success. Ireland ranks next. But many parts of our country are admirably adapted to its culture. The produce of flax in seed is generally from six to eight, but sometimes ranging as high as ten to twelve bushels to the acre. The seed is frequently divided into three sorts—the first sort is reserved for seed; the second for bruising for oil, and the third or refuse is employed at once for the feeding of cattle.

The use of flax in the linen manufacture is well known. The seed is crushed for oil, which is that in common use among painters—the cake or husk which remains after the expression of the oil, is most excellent for fattening cattle. Dried and pulverized it is a good manure for drilled crops. The seeds, in every form, are highly nutritive; they are frequently given boiled to young animals, as calves, and to sick horses and cows. By the process of boiling, a jelly is formed, which all herbiverous animals will eat. For this purpose, the refuse seeds of the flax, not sufficiently good for crushing, is often reserved.

The diseases of flax are few, and are chiefly the fly, which sometimes, though rarely, attacks the plants when young, the mildew, and the rust.

II. HEMP.

Hemp is a plant of equal antiquity with the flax. It is supposed to be of Asiatic origin. It is very generally diffused over the world, and has been used for supplying cordage and cloth for a period unknown. It is a very fine and graceful plant, growing to a great height on good soils. Mixed with corn and other cultivated plants, it gives an air of surpassing richness to the landscape. It is *diœcious*, that is, the male and female flowers are produced on different plants. The leaves of the hemp are powerfully narcotic; its seeds are nourishing, and are eagerly consumed by birds; and they produce an oil which is used for many purposes of the arts.

The uses of hemp are well known, as well as its great importance to the navy for canvass and cordage. For this its tough, durable, and elastic fibres are suited beyond any other substance yet known. The supply of canvass and cordage for our navy and the commercial marine of the United States, is immense; and notwithstanding our country is peculiarly adapted to the culture of hemp, its importance in a national point of view, and the rich return it makes to the careful and judicious cultivator, its cultivation has been sadly neglected.

Soil. Hemp, like flax, prefers a rich vegetable soil; but it is not over nice in its choice, growing in clay, sand, or peat, provided the land is kept rich with manures. But the soils most suitable, and always to be preferred when possible, are those of the deep black putrid vegetable kind, which, from their location, are slightly inclined to moisture. Such soils are abundant in the country, particularly in the west. Mellow, rich, clayey loams do well; and nothing answers better than old meadow land. Hemp, too, possesses the anomaly of growing on the same spot for successive years without degeneracy.

Preparation of the ground. For hemp, the land may be prepared in precisely the same manner as for flax. It is all important that the ground be thoroughly pulverized. But hemp, unlike flax, may either precede or follow a grain crop in the rotation; and the reason is, that while flax invariably renders the land more foul, the tendency of hemp is to smother and choke all other plants. Grass-seeds are not to be sown with hemp, as they would be destroyed under the shade of its thick foliage. The land intended for hemp, should always be ploughed in time to receive the influence of frosts; and when it follows a grain crop, besides a deep ploughing before winter, it should receive two or more ploughings in the spring, so as to reduce the soil to a fine tilth, and free it of all root weeds and extraneous substances.

Seed and sowing. A certain crop cannot be calculated on, whatever may be the culture—unless the seed sown is *fresh*—this may be known by their being heavy and of a bright colour. The common method of sowing hemp is broadcast, requiring generally from two to three bushels of seed to the acre, according to the quality of the land. Hemp is well suited to be sown in *rows.* This method possesses many advantages; it requires less seed, the plants are more regular, allowing the intervals to be well tilled, and admitting air freely to the plants. The distance between the rows may be thirty inches, which will afford room for the operations of the cultivator. As hemp is more easily injured by the frosts of spring, than flax, it is sown later. The most suitable period is perhaps from the 20th of April, to the 10th of May.

In the after culture of hemp, the hand-hoe and cultivator may both be employed to advantage; the latter can be used only when the row-system of cultivation has been adopted. In the first hoeing the plants should be hoed out to the distance from one another of a foot in the rows, and after the interval of a month or six weeks, another horse and hand-hoeing should be given, which will complete effectually the summer culture of the hemp, if planted in rows. But the common practice in some hemp districts is to sow broadcast, hoeing the plants to the distance from one another of twelve or sixteen inches, and giving a second hoeing after an interval of four or six weeks. Some cultivators give no other culture than to pull up the

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larger weeds, trusting to the rapid growth of the hemp to overtop all kinds of plants.

In taking the hemp crop two methods are in use, according to the object in view. When it is grown entirely for its fibre, it is pulled when in flower, and no distinction is made between the male and female plants. But, as it is most generally grown with a view to fibre and seed, the usual practice is to pull the male plants as soon as the setting of the seed in the females shews that they have effected their purpose. As the female plants require four or five weeks to ripen their seeds, the males are thus pulled so long before them, making, as it were, two distinct harvests.* The male plants are distinguished from the female by their producing numerous flowers.

In the operation of *pulling the plants,* the pullers walk between the drills, when the row-system is adopted; and, when the broadcast is used, in the furrows between the ridges, and stretching across, pull up the stalks, taking care not to tread upon or break down those that are to remain. The male plants are easily known at this time by their yellowish colour and faded flowers. When pulled, they are tied in small bunches, previous to being carried to the pool to undergo the process of steeping, as in the case of flax.

When the female plants have matured their seeds, which is known by the brownish colour of the capsules and fading of the leaves, the second pulling takes place. The plants are bound in bunches, and set up on end to dry, in the same manner as sheaves of wheat—the whole are so dried that the capsules can be easily rubbed from the stalk—the sheaves are slightly threshed, and thus the capsules are separated from the stems. This done, the plants are taken in small bunches to the pool to be steeped.

The *produce of hemp in rough fibre,* (that is, before heckling,) varies exceedingly—from four hundred and fifty to eight hundred pounds to the acre. The crop of *seed* is not less various than the fibre. Ten or twelve bushels are considered as a medium produce; but this quantity is often considerably exceeded. ABRAHAM VARICK, Esq., of Utica, New York, exhibited at the Fair of the American Institute in 1832, a bale of very superior rotted hemp, containing four hundred and sixty pounds, raised, rotted and manufactured by Dr. SAMUEL ALLEN, of the county of Lewis. Speaking of the culture, &c., he says the quantity produced will be from three to four tons per acre, which will yield about one-sixth of clean hemp fit for market.

* Encyclopedia of Agriculture, article Hemp, p. 917.

An eminent agriculturist, the Hon. HENRY CLAY of Kentucky, has been at great pains and expense to introduce, successfully, the culture of hemp in the western states. Deeming the subject of vast importance, he some time since prepared an essay on its cultivation. It is a complete treatise on the manner of raising and preparing for market, an article which will always most abundantly repay the persevering and enlightened cultivator. As the document would gain nothing by being curtailed or abridged, we give it entire.

The lands which produce it best, are those which are fresh, or which have lain sometime in grass or clover. Manuring is not yet much practised. Clover is used in lieu of it. Lands which remain in clover four or five years without being too constantly and closely grazed, recover their virgin fertility.

The preparation of the ground for sowing the seed, is by the plough and horses, until the clods are all sufficiently pulverized or dissolved, and the surface of the field is rendered even and smooth. It should be as carefully prepared as if it were designed for flax. This most important point, too often neglected, cannot be attended to too much. Scarcely any other crop better rewards diligence and careful husbandry. Fall or winter ploughing is practised with advantage—it is indispensable in old meadows, or old pasture grounds intended for producing hemp.

Plants for seed are ordinarily reared in a place distinct from that in which they are cultivated for the lint. In this respect, the usage is different from that which is understood to prevail in Europe. The seeds which are intended to reproduce seeds for the crop of the next year, are sowed in drills about four feet apart. When they are grown sufficiently to distinguish between the male and female stalks, the former are pulled and thrown away, and the latter are thinned, leaving the stalks separated seven or eight inches from each other. This operation is usually performed in the blooming season, when the sexual character of the plants is easily discernible; the male alone blossoming, and, when agitated, throwing off farina, a yellow dust or flour which falls and colours the ground, or any object that comes in contact with it. A few of the male plants had better be left scattered through the drill, until the farina is completely discharged, for an obvious reason. Between the drills a plough is run sufficiently often to keep the ground free from weeds and grass; and between the stalks in each drill the hoe is employed for the same object. The seed plants are generally cut after the first smart frost, between the 25th of September and middle of October, and carried to a barn or stackyard, where the seeds are easily detached by the common thrail. They should be gathered after a slight, but before a severe frost; and, as they fall out very easily, it is advisable to haul the plants on a sled, and, if convenient, when they are wet. If transported on a cart or wagon, a sheet should be spread to catch the seeds as they shatter out. After the seeds are separated, the stalks which bore them being too large, coarse, and harsh, to produce lint, are usually thrown away: they may be profitably employed in making charcoal for the use of powder mills.

After the seeds are threshed out, it is advisable to spread them on a floor to cure properly and prevent their rotting, before they are finally put away for use the next spring. Seeds are not generally used, unless they were secured the fall previous to their being sown, as it is believed they will not vegetate, if older; but it has been ascertained that, when they are properly cured and kept dry, they will come up after the first year. It is important to prevent them from heating, which destroys the vegetating property, and for that purpose they should be thinly spread on a sheltered floor.

The seeds—whether to re-produce seeds only, or the lint—are sowed about the same time. Opinions vary as to the best period. It depends a good deal upon the season. The plant is very tender when it first shoots up, and is affected by frost. Some have sowed as early as the first of April; but it is generally agreed, that all the month of May, and about the 10th of it especially, is the most favourable time. An experienced and successful hemp-grower, in the neighbourhood of Lexington, being asked the best time to sow hemp, answered, immediately before a rain.—And undoubtedly it is very fortunate to have a moderate rain directly after sowing.

When the object is to make a crop of hemp, the seeds are sown broadcast. The usual quantity is a bushel and a half to the acre; but here again the farmers differ, some using two bushels or even two and a half. Much depends on the strength and fertility of the soil, and the care with which it has been prepared, as well as the season. To these causes may be ascribed the diversity of opinion and practice. The ground can only sustain and nourish a certain quantity of plants; and if that limit be passed, the surplus will be smothered in the growth. When the seeds are sown, they are ploughed or harrowed in; ploughing is best in old ground, as it avoids the injurious effect of a beating rain, and the consequent baking of the earth. It would be also beneficial subsequently to roll the ground with a heavy roller.

After the seeds are sown, the labours of the cultivator are suspended, until the plants are ripe, and in a state to be gathered—every thing in the intermediate time being left to the operations of nature. If the season be favourable until the plants are sufficiently high to shade the ground, (which they will do in a few weeks, at six or eight inches height,) there will be a strong probability of a good crop. When they attain that height, but few articles sustain the effect of bad seasons better than hemp.

It is generally ripe and ready to be gathered about the middle of August, varying according to the time of sowing. Some sow at different periods, in order that the crop may not all ripen at the same time, and that a press of labour, in rearing it, may be thus avoided. The maturity of the plant is determined by the evaporation of the farina, already noticed, and the leaves of the plant exhibiting a yellowish hue: it is then generally supposed to be ripe, but it is safest to wait a few days longer. Very little attentive observation will enable any one to judge when it is fully ripe. In that respect it is a very accommodating crop; for if gathered a little too soon, the lint is not materially injured, and it will wait the leisure of the farmer some ten days or a fortnight after it is entirely ripe.

Two modes of gathering the plants are practised; one by pulling them up by the roots, an easy operation with an able bodied man; and the other by cutting them about two inches (the nearer the better) above the surface of the ground. Each mode has its partisans, and I have pursued both. From a quarter to a third of an acre, is the common task of an average labourer, whether the one or the other mode is practised. The objections to pulling are, that the plants with their roots remaining connected with them, are not afterwards so easily handled in the several operations which they must undergo; that all parts of the plant do not rot equally and alike, when exposed to the dew and rain; and, finally, that before you put them to the brake, when the root should be separated from the stalk, the roots drag off with it some of the lint. The objection to cutting is, that you lose two or three inches of the best part of the plant nearest the root. Pulling, being the ancient method, is most generally practised. I prefer, upon the whole, cutting—and I believe the number who prefer it is yearly increasing. When pulled, it is done with the hand, which is better for the protection of an old leather glove. The labourer catches twenty or thirty plants together, with both hands, and, by a sudden jerk, draws them up, without much difficulty. The operation of cutting is performed with a knife, often made out of an old scythe, resembling a sickle, though not quite so long, but broader. This knife is applied much in the same way as the sickle, except that the labourer stoops more.

Whether pulled or cut, the plants are carefully laid on the ground, the evener the better, to cure—which they do in two or three days in dry weather. A light rain falling on them whilst lying down, is thought by some to be beneficial, inasmuch as the leaves, of which they should be deprived, may be then easier shaken off or detached. When cured, the plants are set up in the field in which they were produced, in shocks of convenient size, the roots or butt ends resting on the ground, and the tops united above by a band made of the plants themselves. Previous to putting them up in shocks, most cultivators tie the plants in small hand bundles of such a size as that each can be conveniently held in one hand. Before the shocks are formed, the leaves of the plants should be rapidly knocked off with a rough paddle or hooked stick. Some suffer the plants to remain in these shocks until the plants are spread down to be rotted. Others, again, collect the shocks together as soon as they can command leisure, (and it is clearly best,) and form them into stacks. A few farmers permit these stacks to remain over a whole year, before the plants are exposed to be rotted. I have frequently done it with advantage, and have at this time two crops in stacks. By remaining that period in stacks, the plants go through a sweat, or some other process, that improves very much the appearance, and, I believe, the quality of the lint, and this improvement fully compensates the loss of time in bringing it to market. The lint has a soft texture and a lively hue, resembling water-rotted hemp; and I once sold a box of it in the Baltimore market at the price of Russia hemp. In every other respect, the plants are treated as if they were not kept over a year.

The method of dew-rotting is that which is generally practised in Kentucky. The lint so prepared is not so good for many purposes, and especially for the rigging of ships, as when the plants have been rotted by immersion in water, or, as it is generally termed, water-rotted. The greater value, and consequently higher price of the article, prepared in the latter way, has induced more and more of our farmers every year to adopt it; and, if that prejudice were subdued, which every American production unfortunately encounters, when it is first introduced and comes in competition with a rival European commodity, I think it probable that, in a few years, we should be able o dispense altogether with foreign hemp. The obstacles which prevent the general practice of water-rotting, are, the want of water at the best season for the operation, which is the month of September; a repugnance to the change of an old habit; and a persuasion which has some foundation, that handling the plants, after their submersion in water during that month is injurious to health. The first and last of these obstacles would be removed by water-rotting early in the winter, or in the spring. The only difference in the operation, performed at those seasons and in the month of September, would be, that the plants would have to remain longer in soak before they were sufficiently rotted.

The plants are usually spread down to be dew-rotted from the middle of October to the middle of December. A farmer who has a large crop on hand, puts them down at different times for his convenience in handling and dressing them. Autumnal rotting is more apt to give the lint a dark and unsightly colour than winter rotting. The best ground to expose the plants upon is meadow or grass land, but they are not unfrequently spread over the same field on which they grew. The length of time that they ought to remain exposed, depends upon the degree of moisture and the temperature of the weather that prevail. In a very wet and warm spell five or six weeks may be long enough. Whether they have been sufficiently rotted or not is determined by experiment. A handful is taken and broken by the hand or applied to the brake, when it can be easily ascertained, by the facility with which the lint can be detached from the stalk, if it be properly rotted. If the plants remain on the ground too long, the fibres lose some of their strength, though a few days longer than necessary, in cold weather, will not do any injury. If they are taken up too soon, that is before the lint can be easily separated from the woody part of the stalk, it is harsh, and the process of breaking is difficult and troublesome. Snow-rotting, that is when the plants, being spread out, remain long enough to rot, (which, however, requires a greater length of time,) bleaches the lint, improves the quality, and makes it nearly as valuable as if it had been water-rotted.

After the operation of rotting is performed, the plants are again collected together, put in shocks or stacks, or, which is still better, put under a shed or some covering. When it is designed to brake and dress them immediately, they are frequently set up against some neighbouring fence. The best period for breaking and dressing is in the months of February and March, and the best sort of weather, frosty nights and clear thawing days. The brake cannot be used advantageously in wet or moist weather. It is almost invariably used in this state out of doors and without any cover, and to assist its operation, the labourer often makes a large fire near it, which serves the double purpose of drying the plants and warming himself. It could not be used in damp weather in a house, without a kiln or some other means of drying the stalks. For description of the brake, see chapter on Agricultural Implements.

The brake in general use, is the same hand brake which was originally introduced, and has been always employed here, resembling, though longer, the common flax brake. It is so well known as to render a particular description of it, perhaps, unnecessary. It is a rough contrivance, set upon four legs about two and a half feet high. The brake consists of two jaws with slits in each, the lower jaw fixed and immoveable, and the upper one moveable, so that it may be lifted up by means of a handle inserted into a head or block at the front end of it. The lower jaw has three slats or teeth made of tough white oak, and the upper two, arranged horizontally about six inches apart in the rear, and gradually approaching to about two inches in front, and in such manner that the slats of the upper jaw play between those of the lower. These slats are about six or seven feet in length, six inches in depth, and about two inches in thickness in their lower edges; they are placed edgeways, rounded a little in their upper edges, which are sharper than those below. The labourer takes his stand by the side of the brake, and grasping in his left hand as many of the stalks as he can conveniently hold, with his right hand he seizes the handle in the head of the upper jaw, which he lifts, and throwing the handful of stalks between the jaws, repeatedly strikes them by lifting and throwing down the upper jaw. These successive strokes break the woody or reedy part of the stalks into small pieces or shoes, which fall off during the process. He assists their disengagement by striking the handful against a stake, or with a small wooden paddle, until the lint or bark is entirely clean, and completely separated from the woody particles.

Scutching to soften it and strengthen the threads, may now be performed. That process, however, is not thought to be profitable, and is not, therefore, generally performed by the grower, but is left to the manufacturer, as well as that of beating and heckling it. Scutching is done by the labourer taking in his left hand a handful of the lint and grasping it firmly, then laying the middle of it upon a semi-circular notch of a perpendicular board of the scutching frame, and striking with the edge of the scutch that part of the lint which hangs down on the board. After giving it repeated strokes, he shakes the handful of lint, replaces it on the notch, and continues to strike and turn all parts of it, until it is sufficiently cleansed, and the fibres appear to be even and straight.

The usual daily task of an able bodied hand at the brake is eighty pounds weight, but there is a great difference not only in the state of the weather, and the condition of the stalks, produced by the greater or less degree in which they have been rotted, but in the dexterity with which the brake is employed. Some hands have been known to break from one hundred and fifty to two hundred pounds per day. The labourer ties up in one common bundle the work of one day, and in this state it is taken to market and sold. From what has been mentioned, it may be inferred, as the fact is, that the hemp of some growers is in a much better condition than that of others. When it has been carelessly handled or not sufficiently cleansed, a deduction is made from the price by the purchaser. It is chiefly bought in our villages, and manufactured into cotton bagging, bales, and other kinds of untarred cordage. The price is not uniform. The extremes have been as low as three, and as high as eight dollars, for the long hundred—the customary mode of selling it. The most general price, during a term of many years, has been from four to five dollars. At five dollars it compensates well the labour of the grower, and is considered more profitable than any thing else the farmer has cultivated. The most heavy labour in the culture of hemp, is pulling or cutting it when ripe, and breaking it when rotted. This labour can easily be performed by men. Various attempts have been made to improve the process of breaking, which is the severest work in the preparation of hemp.

A newly invented machine was erected for that purpose on my farm six or eight years ago, to dress hemp by dispensing with rotting altogether, similar in structure to one which was exhibited about the same time at Columbus, during the sitting of the Ohio legislature. It was worked by horse power, and detached the lint tolerably well, producing a very fine looking article, equalling in appearance Russia hemp. A ton of it was sold to the navy department, which was manufactured into rigging for the ship of the line the North Carolina, prior to her making a voyage of three years in the Mediterranean. Upon her return, the cordage was examined and analyzed; and, although its exterior looked very well, it was found on opening it, to be decayed, and affected somewhat like the dry rot in wood. I considered the experiment decisive; and it is now believed that the process of water or dew-rotting is absolutely necessary, either before or after the hemp has been to the brake. There is a sappy or glutinous property of which it should be divested, and that is the only process that has been hitherto generally and successfully employed to divest it.

An ingenious and enterprising gentleman in the neighbourhood of Lexington, has been, ever since the erection of the above mentioned machine, trying various experiments, by altering and improving it, to produce one more perfect, which might be beneficially employed on rotted hemp, to diminish the labours of the brake. He mentioned the other day that all of them had failed; that he had returned to the old hand brake, and that he was convinced that it answered the purpose better than any substitute with which he was acquainted. I observe Mr. H. L. Barnum has recently advertised a machine, which he has constructed for breaking hemp and flax, which can be procured at the establishment of Mr. Smith, in Cincinnati. I most cordially wish him success; but the number of failures which I have witnessed, during a period of thirty years, in the attempts to supersede manual labour by the substitution of that of machines, induces me to fear that it will be long before this desideratum is attained.

The quantity of nett hemp produced to the acre, is from six hundred to a thousand weight, varying according to the fertility and preparation of the soil, and the state of the season. It is said that the quantity which any field will produce, may be anticipated by the average height of the plants throughout the field. Thus—if the plants will average eight feet in height, the acre will yield eight hundred weight of hemp, each foot in height corresponding to a hundred weight of the lint.

Hemp exhausts the soil slowly, if at all. An old and successful cultivator told me that he had taken thirteen or fourteen successive crops from the same field, and that the last was the best. That was probably, however, owing to a concurrence of favourable circumstances. Nothing cleanses and prepares the earth better for other crops (especially for small grain or grasses) than hemp. It eradicates all weeds, and when it is taken off, leaves the field not only clean, but smooth and even.

Water rotting of hemp is performed in England, and we believe throughout Europe, in the following manner. The bunches are placed in the pools in rows, crossing one another, and pressed down by some heavy substance, so as to prevent their rising to the surface; special care being at the same time taken that they are not so loaded as to be pressed down to the bottom. If the weather be warm, four or five days will frequently be sufficient; if not, two or three more: the period is denoted by the stem being so softened that the outside coat shall come easily off. Care must be taken, as in the case of flax, that the putrefactive process does not proceed so far as to injure the cortical fibres. The quantity placed in one pool may be the produce of an acre; but it is better that the quantity be small and the pits shallow. When thus steeped, it is like flax taken out of the pool—and the plants spread singly and regularly on a plot of sward.

When hemp is thus spread out, it generally lies from four to six weeks on the surface, subject to the influence of the rains and dews, by which the decomposition of the ligneous part of the stem is promoted, and is rendered hard and brittle. It is to be carefully turned over two or three times a week. When fit for removal, it is re-bound in bunches, and carried to the barn, where it undergoes the process of bruising by the machine called a break, as in the case of flax. After the hemp has undergone the process of breaking, it generally passes into the hands of various artisans. The first operation is that of heckling, either by hand or machinery. It is first beat, and then dressed by means of fixed heckles resembling those used for flax. Arranged into sorts and parcels to suit purchasers, it then passes into the hands of the spinner, the weaver, and of the bleacher. But the operations are all frequently performed on a small scale on the farm.

III. COTTON.

COTTON is the great staple of the United States, affording the rich mine from which we draw the means of paying for the enormous quantity of the productions of foreign art now necessary, in consequence of long and improper indulgence, to the daily comfort of almost all classes of our population. Its history is replete with interest. ELI WHITNEY, a native of Massachusetts, who settled in Georgia as a tutor, about the year 1792, gave to the cotton culture its first mighty impulse by the invention of a machine—*the American Saw-gin*—by which the seed is separated from the fibre perfectly, and with the most astonishing rapidity. This invention was not the result of accident, but the result of systematic application, of earnest thought and powerful mechanical genius.

Of what country cotton is a native is not known. There are different species of the plants, but all are natives of warm climates. The word or term cotton is said to be of Arabic origin. The plant which produces the down, called "cotton," is of three or four general varieties—the tree or shrub, the annual, herbaceous, &c. The kinds chiefly cultivated now, and especially in the United States, are the latter. The Sea Island cotton is grown to some extent in Georgia, South Carolina and Florida.

It is difficult to trace back with accuracy its earliest cultivation. It is found indigenous in South America and in parts of

Africa; and the chief clothing of the inhabitants of South America and Mexico, was of cotton when the continent was first discovered by the Spaniards. It was probably grown and used largely in Arabia, India, America and Africa by the ancients. In China, its cultivation began in the 13th century, for the purposes of manufacture, though previously raised in gardens for ornament. In the West Indies, cotton was grown first in 1776, at St. Domingo, but earlier in other islands. It was first planted or cultivated in Brazil in 1781, for exportation. In 1786, cotton was first grown in the United States, and the first exportation, of which we have any account, was in the year 1770, of foreign growth, when five bales or bags were exported. The first exportation of native growth took place in 1791.

The *capital* employed in the cultivation of cotton in the United States, is estimated by the Secretary of the Treasury at nine hundred and eighteen millions of dollars. It includes two millions of acres of land devoted to the culture of cotton; at twenty dollars per acre; three hundred and forty thousand field hands, with the lands, stock, and labour necessary to maintain them, &c. The estimate of the number of labourers is based upon the supposition of one field labourer to every six acres of cotton. Some, however, think that as many as five hundred and fifty thousand hands are employed; but all, not constantly, in the cotton culture.

The quantity exported in 1790, was four hundred thousand; in 1791, two hundred thousand; and in 1792, one hundred and fifty thousand pounds. Its diminution even in the last two named years, furnishing, even in the absence of all other testimony, the most conclusive evidence of the difficulty of preparing the commodity for market. In 1795, after the *saw-gin* had begun to operate to a considerable extent, the export was six millions two hundred and fifty thousand pounds. From this period, the exportation has gradually increased to its present extent—being in the year 1835, the last year stated by Secretary Woodbury, three hundred and thirty-six millions five hundred thousand pounds. From other authentic sources we have ascertained that the exports of 1836, was upwards of four hundred and twenty-three millions of pounds.

The whole of the exportation of cotton from the United States, during the first three years before stated, (1790–1–2,) would hardly suffice for the cargo of a single ship of the size now usually employed in freighting it to Europe; while, in 1836, if we add to the quantity exported that used in the middle states for domestic purposes and our extensive manufactures, which cannot be fairly estimated at less than one hundred and twenty-five millions of pounds, the aggregate would not fall far short of enough to freight a thousand such ships. Such a wonderful increase in the production of a single article, within so short a period, cannot fail to fill the mind with astonishment.

The late Pierce Butler, Esq., one of the most successful cotton growers, left the following directions for its culture:

"If the land has been recently cleared, or has long remained fallow, turn it up deep in winter; and in the first week in March bed it up in the following manner: Form twenty-five beds in one hundred and five square feet of land; (being the space allotted to each labourer for a day's work;) this leaves about four feet two and one half inches from the centre of one bed to the centre of the next. The beds should be three feet wide, flat in the middle. About the 15th of March, in latitude from twenty-nine to thirty degrees, the cultivator should commence sowing, or, as it is generally termed, planting. The seed should be well scattered in open trenches, made in the centre of the beds, and covered. The proportion of seed is one bushel to one acre; this allows for accidents occasioned by worms or night chills.

"The cotton should be well weeded by hoes once every twelve days till blown, and even longer if there is grass, observing to hoe up, that is, *to* the cotton, till it pods, and hoe down when the cotton is blown, in order to check the growth of the plant. From the proportion of seed mentioned, the cotton plants will come up plentifully, too much so to suffer all to remain. They should be thinned moderately at each hoeing. When the plants have got strength and growth, which may be about the third hoeing, to disregard worms and bear drought, they should be thinned, according to the fertility of the soil, from six inches to near two feet between the stalks or plants.

"In rich river grounds, the beds should be from five to six feet apart, measuring from centre to centre; and the cotton plants, when out of the way of the worms, from two to three feet apart. It is advisable to top cotton once or twice in low grounds, and also to remove the suckers. The latter end of July is generally considered a proper time for topping. Gypsum may be used with success on cotton lands *not near the sea*. In river grounds draining is proper; yet these lands should not be kept too dry. In tide lands it is beneficial to let the water flow over the land without retaining it. In river lands a change of crops is necessary. From actual experiment it has been proved that river tide lands, having the preceding year had rice sown on them, yielded much more cotton the succeeding year than they would have afforded by a continuation of cotton. The mere growing of cotton is but a part of the care of the planter; very much depends on classing and cleansing it for market, after it has been housed. Sorting it before it goes to the jennies, moteing and removing any yellow particles, are essential to assure a preference at a common market of competition."

The twin or okra cotton. The following interesting particulars respecting this new and favourite species, are detailed in a letter from an eminent planter: "The discovery of it appears to have been entirely accidental. A gentleman of Autauga, Alabama, a few years ago bought some Petit Gulf seed; in a field sown with this seed, a single stalk was observed without limbs, and having a great number of bolls adhering immediately to the stalk, or in clusters on very short limbs. From these seeds the variety has been propagated. In 1837, the seeds sold as high as fifty cents a piece; last fall one hundred and sixty dollars was paid for a bushel. The plant exhibits a distinct variety; the stalk had rarely any limbs longer than one joint, sometimes two; the bolls were two, three, and sometimes seven in a cluster; the stems of the bolls shooting from one place, and at the top of the short limb. The cotton is exceedingly fine, being from two to four cents a pound better than ordinary; the colour and staple of the wool is described as very superior, and unequalled by the finest and softest short staple. Another advantage of this variety is, that it comes to maturity and opens two weeks earlier than common; in rich land the stalk grows quite tall, reaching as high as six or eight feet; the luxuriant growth of the plant in fertile soils may render topping necessary; its appearance is very much like the common okra, having a similar stalk, with common leaves. If the anticipations indulged respecting this lately discovered variety of the cotton plant are ever realized, the success of the experiment must add immensely to the agricultural wealth of Louisiana, Mississippi, and other southern states."

It is thought by many, and indeed it is proved by the experience of those who have ventured on the process, that the application of salt, as a manure, has a highly beneficial influence upon the growth of the plant. A correspondent of the Southern Cultivator says,

Last year I planted a piece of land containing fifty acres. It had never before produced well. I should state that ten acres of it was new land, never planted before. The balance, forty acres, had been planted for many years previous. I had several times manured it with compost manure. The cotton grew well on it; but, except in a very prime season, I could never get the plants to retain their fruit. I had heard of the efficacy of salt-mud, and salt-marsh; but as I could procure neither of these, except with great trouble, I determined to try common salt. I did so; and my mode of doing it was as follows: I applied one bushel to each acre, spreading it in the alley, and then listing upon it. The effect upon the cotton was highly beneficial. From its shooting forth until the time I picked it in, it exhibited a healthy and vigorous growth, and my product of cotton was greater and better than I had ever known it. It is enough for me to state, that the same land had never before produced me more than one hundred pounds of cotton to the acre. It now gave me one hundred and thirty. On the new ground, the effect was manifest. I had never planted new ground before, for the first year, without the cotton all running to stalk. It now grew well, and produced me, at the least calculation, one hundred and fifty pounds of clean cotton to the acre.

IX.—PLANTS CULTIVATED FOR THEIR OILS.

The plants most generally cultivated for their oils, are, 1. The rape, and other plants of the cabbage genus. 2. The mustard and radish. 3. Hemp and flax. 4. The poppy. The oils which these plants yield, are obtained by bruising or crushing their seeds, which operation is performed in a great variety of ways—they are termed *fixed oils*. There is another class of oils obtained by distillation, termed *volatile oils*. These last are yielded mostly by plants of the mint family—but the plants producing them are rarely the subjects of cultivation on the large scale. Our chief oil plant is the flax. The growing of the oil plants form an important part of the agriculture of many countries.

The method of cultivating this plant—the flax—for its fibre, has been pretty fully described; and there is no other difference in the manner of cultivating it for its seeds, than permitting the plant to stand until the seeds are fully ripe. The seeds are bruised in the same manner as those of the other oleaginous plants. The refuse, after expression, is termed *oil-cake*, and forms a nutritive food for cattle. The mills used for bruising the seeds in many parts of the country, are constructed on very simple principles. More perfect machinery is necessary. The seeds of *hemp*, in like manner, yield oil, which is employed for nearly the same purposes as the oil of flax. But the preparation of the flax and expression of the oil, should form a distinct profession—they do not of right belong to the labours of the farm, although sanctioned by an almost universal practice.

I. RAPE.

Rape is now considered as the principal oil plant of Europe—and is cultivated on a very extensive scale, especially in England, Holland, the Netherlands, Germany and France. It is a plant admirably adapted to this country. About the year 1823 or 1824, an English gentleman cultivated it to some considerable extent in the county of Philadelphia, but for some reason, never yet fully explained, it was discountenanced by our farmers. From one bushel of the seed a gallon of fine and superior oil was extracted which sold readily for one dollar. The manner of cultivating the rape has been already described. [Page 152.]

Among the various plants which may be cultivated by the farmer *as oil plants,* are all the species of the *Brassica* family—the *Sinapis,* or mustard genus—the *Raphanus,* or radish genus, with many others of the natural order of cruciferea. Of the genus *Sinapis,* either the white or the black species may be sown. The black mustard, *Sinapis nipu,* is the species usually cultivated for that well known and useful condiment—mustard. But the white species, *Sinapis alba,* being more productive in pods, and less liable to injury from insects, is better calculated for the production of oil. The *Raphanus,* or radish, is equally suited to yield oils as the mustard. It should be cultivated in rows, and sufficient room given to it. It flowers and bears seeds for a long time during the season, but no difficulty exists in knowing the proper period for gathering.

The *Small or Field Poppy,* as well as the *maw seed,* a variety of the garden poppy, is extensively cultivated on the continent of Europe—and to some small extent in various parts of our country, as affording an oil well suited for domestic uses—it being esteemed in domestic economy next to that of the olive. The soil for the poppy requires to be well pulverized and manured. In Flanders this point is especially attended to. It frequently succeeds rape, in the rotation, manure being applied to both. It is cultivated in rows, sown in April, and the plants thinned out to six or eight inches distance from each other; kept free of weeds till they begin to run. The capsules as they ripen are gathered by hand, and dried in the sun.

The *Sun-flower—Helianthus annuus*—is a native of America, easily cultivated, and familiar to us all as one of our most majestic and beautiful garden flowers. Its value as an oil plant has been known for at least a century, yet strange to say, very little care or systematic attention has been devoted to it. Of its value no doubt is entertained; and that it may be cultivated to a profit, is certainly as clear. The "Farmers' Assistant"—which is considered as high authority, says, that the seeds of the sun-flower afford an oil equal to that of the olive-tree; and that seventy bushels of seed may be raised to the acre. The seeds are good for poultry during the winter season. The editor further states, but not on his own authority, that a "bushel of the seed will produce a gallon of oil, as fine as the best imported Florence, and may be obtained at any time from the seeds, quite soft, bland, and fresh, and that the mass remaining after pressing out the oil, is of excellent use to feed hogs, poultry," &c. There are various other uses to which the plant may be appropriated.

In France, and other foreign countries, the stems are employed for fuel, pea-sticks, &c., and the leaves for fodder. A writer in the Farmers' Register,* after observing that he had cultivated the plant for several years, says, "about the time my long forage gives out, these (the sun-flower) begin to bloom. As the blossoms appear, I cut them off about a foot from the ground and give them to my horses, which eat them very readily—leaves, buds, stalks and all. This I consider a very wholesome as well as nutritious food." The plants to which this writer refers were raised along the fences leading to his homestead, instead of suffering, as is too often the case, such spaces to be occupied and overrun with noxious weeds, to the great injury of the adjacent fields.

The sun-flower requires a good soil—well manured, thoroughly worked, and perfectly cleaned. The seeds are to be sown in rows, early in the spring, the rows two feet asunder. The distance between the plants in the rows should be twelve to fifteen inches. They require but very little care or attention after they have acquired strength—but it is nevertheless indispensable to keep the ground free of weeds. The proper period of gathering the seeds is when fully ripe, and cannot be mistaken.

Another of the oleaginous plants is the *American Earth-nut*—*Arachis hypogœa*—which is found wild and in great abundance in some parts of the southern states, of which it is a native. It is cultivated in the south of Europe, and has been made, with special care, to ripen its seeds in the latitude of Paris. It is remarkable for ripening its seeds under ground.

* Vol. vi., page 208, published at Petersburg, Virginia, by E. Ruffin, Esq.

X.—PLANTS CULTIVATED FOR THEIR DYES.

THE Madder, *Rubia tinctorum.* The Woad, *Isatis tinctoria*—and the Weld, *Reseda Luteola*—are the plants usually cultivated on the large scale for their dyes; in the north of Europe; but innumerable other plants yield those beautiful substances, and are partially cultivated. The plants above designated are useful in a rotation of crops, and are adapted to our climate.

I. MADDER.

Madder is the *Evythros* of the Greeks, and the *Rubia* of the Latins—so called from its imparting a fine durable red colour to wool, leather, &c. It is cultivated in the Levant, France, Flanders and England; but no where more extensively or profitably than in Holland; the province of Zealand is literally covered with it, from whence it is imported to every part of Europe and America. The little island of Schowen alone gives annually one hundred thousand tons of the root. The profit of its culture is immense—almost incalculable.

It has a perennial root, and an annual stalk. The root is composed of large succulent fibres which strike deep into the ground, sometimes more than three feet. From the upper part, or head of the root, many side roots are thrown out, which extend just under the surface of the ground to a great distance, whereby it propagates very fast—for these send up a great number of shoots, which, if carefully taken off in the spring soon after they appear above ground, become so many plants.

The most suitable soils for the madder crop are deep, fertile, sandy loams, not retentive of moisture; and the more of vegetable matter it contains in its composition the better. It is grown on the light soils, when fertile, and well replenished with manure, provided they are of sufficient depth. The ground should be ploughed or mellowed to the depth of two and a half or three feet. *The seed is generally sown* from the middle of April to the middle of May. Some plant in *rows* from two to three feet asunder, and five or six inches apart in the rows. Others plant in beds with intervals between, out of which earth is thrown in the lazy-bed manner of growing potatoes. The best method of planting is by the dibber. The *after culture* consists in hoeing, weeding and keeping the soil well and deeply pulverized by the use of pronged hoes. Earthing up is not only unnecessary but injurious. The crop is *gathered* the third autumn after planting, and generally in the month of October. The seed may be collected in great abundance from the plants in the September of the second and third years; but it is never so propagated. In general it has few diseases; but is sometimes, though rarely, blighted.*

Madder has been more extensively cultivated in the United States than any other plant of the same family. Mr. Russel Bronson, formerly of Bridgewater, New York, but now of Birmingham, Huron county, Ohio, has devoted considerable attention, it appears, to the introduction and culture of the madder. The following paragraphs are from a communication published some time since on this subject by Mr. Bronson:

A location facing the south or south-east is to be preferred. A sandy loam not over stiff and heavy, or light and sandy, or a good brown, deep, rich upland loam, free from foul grass, weeds, stones or stumps of trees. Where a crop of potatoes, peas, corn or wheat has been cultivated the past season, plough deep twice, once in September and once in October, and if rather stiff let it lie after the plough until spring. When the spring opens, and the ground has become dry and warm, (say in Tennessee, 1st of April, Ohio, 15th, and New York, 25th to 1st of May—I speak of the spring of 1836.) Plough again deep, the deeper the better, then harrow well and strike it into ridges with a one horse plough, three feet wide and four feet vacant, or making a ridge once in seven feet, raising it if on rather moist ground, eight or ten inches, and dry land six or eight from the natural level, then with a light harrow level, and shape the ridges like a well formed bed of beets, &c.

We will suppose you intend to plant one acre of ground, and that you have purchased eight bushels of tap roots in the fall and buried them like potatoes on your premises—count the ridges on your acre, and take out of the ground one bushel of roots and plant it on one-eighth of your ridges; you will then be able to ascertain how to proportion your roots for the remainder. The following is the *manner of planting, cultivating*, &c., when the quantities of ground do not exceed three or four acres. One person on each side of the ridge to make the holes, (plant four inches below the surface of the bed, or thereabouts, when covered,) one on each side to drop the roots, and one on each side to cover, pressing the hill like that of planting corn, or three persons on one side, as the case may be, whether you have one or more acres to plant. Let the owner be the dropper of roots, and his most thorough assistants behind him. Make the holes from twelve to eighteen inches apart, and about six inches from the edge of the ridge. As the plants are supposed to have been purchased in the fall, the roots may have thrown out sprouts, and possibly have leaved. In this case, in dropping and covering, you will leave the most prominent sprout or sprouts a little out of the ground, as where a plant has leafed, it ought not to be smothered.

When the plant gets up three or four inches, weed with the hoe, and plough with one horse, between the ridges or beds, but not on them; this will take place two or three weeks after planting. When up twelve or fifteen inches, many of the tops will fall; assist them with a ten foot pole; two persons cross them each way across the bed, cover them with a shovel or garden rake, throwing the soil from between the ridges. After loosening with the one horse plough, you will with a shovel scatter the earth between the stalks rather than throw it into heaps; of course we wish to keep the stalks separate, as they are to form new and important roots in the centre of the beds. About the 20th of

* Encyclopedia of Agriculture, page 919.

June, you may plough between the beds, and scatter more earth on the fresh tops, (all but the ends,) and when you get through, you may plant potatoes between the beds if you please. I do not recommend it, if you have plenty of land, although I raised one thousand and seventy bushels of pink eyes on eight acres the first year, and sixty bushels of corn. If your land is perfectly clear of weeds, you are through with your labour on the madder crop for this year, except in latitudes where there is not much snow, and considerable frost; in this case cover in October two inches or thereabout. Second year, same operations in weeding, but no crop between; cover once in June. Third year, weed only. Fourth year, weed in the spring, if a weedy piece of ground.

Begin to plough out the roots in Tennessee, [three years old] first September. Ohio, [four years] same time. New York 15th or 20th, after cutting off the tops with a sharp hoe. In ploughing out the roots use a heavy span of horses, and a large plough. We ought to choose a soil neither too wet nor too dry, too stiff or light. Shake the dirt from the roots, and rinse or wash, as the soil may be, stiff or light; dry in a common hop kiln; grind them in a mill after Wilson's Patent Coffee Mill; this mill weighs from one to two pounds. The madder mill may be from sixty to eighty pounds weight. Grind coarse, and fan in a fanning mill; then grind again for market. The profit of this crop is immense; the exhaustion of soil trifling, and glutting the market out of the question.

Madder is used in whole, or part, for the following colours on wool, both in England, France, and America, viz: blue, black, red, buff, olive-brown, olive, navy blue, and many others; finally it produces one of the most beautiful, durable, and healthy colours that is at this time dyed; as for calico printers, it enters greatly into their dyes.

II. WOAD.

Woad is one of those plants which yield the deep blue colouring matter so greatly valued in the arts—*Indigo.* The *use* of woad in dyeing is as a basis for black and other colours. It was most extensively cultivated in Europe previous to the introduction of the indigo of commerce, which is derived from the green parts of certain species of plants, the production of warmer countries. It is a perfectly hardy plant. A triennial, with a hairy branching stalk rising to the height of three to five feet. May be sown in early spring, in which case a certain produce of leaves may be obtained the same season. Chaptal says that it is not killed by frosts in France, and that it affords excellent food for cattle during the winter.

A good crop may be obtained upon alluvial soils, but strong soils are preferable, provided they are not too much inclined to clay. Wet moist lands will not answer. The plant flourishes best in a rich, deep, mellow soil. It requires perfect preparation of the ground and careful tillage during the entire period of its growth. The best method of planting is in rows, the intervals being of a sufficient width to admit the cultivator or horse-hoe. But it is generally sown broadcast. When sown broadcast and harrowed in, six to eight pounds of seed are required to the acre. New seed should always be preferred to old. The seed should be invariably steeped for some time before planting, as germination will be hastened by it.

It is mostly grown on a flat surface, though it may be cultivated in raised drills or beds. When the leaves have attained their full size, and before they have begun to change to their pale colour, they are picked off by hand, and in this manner several successive crops are obtained during the season. When the plants have shot forth their flowering stems, the land is ploughed and prepared for another kind of crop.

The produce is mostly from about a ton to a ton and a half of green leaves to the acre. To prepare it for the dyer it is bruised by machinery, to express the watery part; it is afterwards formed into balls and fermented—re-ground and fermented in vats, where it is evaporated into cakes in the manner of indigo. The haulm is either burned for manure, or carried to the barn-yard, and mixed with other straw and refuse to be worked up and fermented. To *save seed*, let the leaves remain on some of the plants the second year, and when ripe in July or August, treat it like turnip seed. The mildew and rust are the only *diseases* to which this plant is subject; yet it sometimes suffers very much from the attacks of the fly, and the ground obliged to be re-sown. The preparation of this plant for the dyer, requires a minute care scarcely compatible with the regular business of the farm.

III. WELD OR DYERS WEED.

WELD is a native of the south of Europe, an imperfect biennial, with small fusiform roots, and a leafy stem from one to three feet in height—*Loudon.* It belongs to the mignonette family—*Resedaceæ;* and is sometimes found in earth brought from a great depth, as the rubbish of coal-mines. The weld affords a fine yellow dye for cotton, wool, silk, and other substances. Its culture may be considered the same as that of the woad, only being a smaller plant it is not thinned out to so great a distance; and it has this advantage for the farmer over all other colouring plants, that it only requires to be taken up and dried, when it is fit for the dyer.

It is the most easily cultivated of all the dye-plants, of which we have any knowledge. It grows on a great variety of soils; but fertile loams produce the best crops. It is also cultivated in the same manner as the clovers and common grasses; being sometimes mixed with the clovers and grasses, and plucked up from amongst them when it is in flower. But the sure way of cultivating it, and the only one we can recommend to beginners, is by itself—in which case it may be sown in the month of May or later—broadcast or in rows—the ground having been well prepared, the surface smoothed, and the seeds, which are very small, lightly covered.

The plants are to be carefully cleansed during their growth, and in July of the second year, they will be in full flower. The period of pulling is when the bloom has been produced the whole length of the stem, and the plants just beginning to turn of a light or yellowish colour. At this time the seeds are not ripe. The plants are pulled up by the roots, and set upright, generally four together, to dry. When sufficiently dried, which will require a week or more, they are bound into large bundles, in which state they are ready for sale—or they may be stacked and preserved for years without suffering injury. The dye, when extracted from the stalk, must be soon used, otherwise it will ferment and be lost.

The produce varies greatly, according to the nature of the season, varying from half a ton to two tons to the acre. It sometimes yields a large profit—but the demand is uncertain. To *save seed*, select a few of the largest and healthiest plants, and let them stand until the seed are perfectly ripe: they are easily separated. The chief disease of weld is the mildew, to which it is subject while young, and this is one reason why it is very often sown with grass and grain crops.

IV. INDIGO.

Three species of this plant are cultivated—the Wild, (*Indigo fera argentea*)—the Guatemala (*dispermea*), and the French (*tincto ria*). The first named is the hardiest plant, and affords the deepest or best blue; but one of the other two species is commonly preferred, as being more productive; and in this the French surpasses the Guatemala in quantity, but yields to it in fineness of grain and beauty of colour.

Indigo is a tap-rooted plant—will endure severe drought—but is unsuitable for wet lands. In the West Indies, it may be raised in comparatively poor dry soils—but to most advantage in those that are rich. In the southern states, where its culture is attended to, on a limited scale however, it requires a good rich deep soil. The southern parts of the United States is tolerably well adapted for the culture of this plant; but it is more productive still farther to the south, particularly in many of the West India Islands where it is indigenous.

A bushel of seed of this plant is sufficient for five acres. The ground is first to be properly mellowed with the plough, and then harrowed, when the seeds may be sown with a drill in rows, at the distance of about twelve or fourteen inches apart, in a manner very similar to that which is directed for the culture of onions.—*Nicholson's Farmer's Assistant.*

V. BASTARD SAFFRON.

The bastard saffron, *Carthamus tinctorius,* is an annual plant, rising with a stiff ligneous stalk, two feet and a half or three feet high, dividing upwards into many branches. It is a native of Asia. Sown in April, it flowers in July and August, and its seeds ripen in autumn. The dye produced is of two kinds—a yellow and red. It is cultivated in various parts of Europe, especially in Germany; very extensively in Egypt and the Levant, whence great quantities are annually imported into England and France for painting and dyeing. The seeds yield an oil which is used in medicine and painting.

According to Loudon, the soil it requires is light, and the preparation and culture, according to Von Thaer, equal to that of the garden. Gen. Armstrong says, it succeeds but in rich friable black earth, or in one of a dark red or chocolate colour. The seed is sown in rows, or deposited in patches two feet apart each way; and in the process of early culture, they are thinned out so that only two or three remain together. The soil is to be well stirred and kept free of weeds. In August the flowers begin to expand; the petals of the florets are then to be cut off, and dried in the shade or on a kiln. They are then ready for market. This operation is best performed in the early part of the day, and may be continued daily until October, when the plants are to be pulled up, sheaved and shocked, and threshed for their seeds. The stalks are burnt for manure. The flowers of this plant always precedes the leaves.

A vast number of other plants could be enumerated as yielding dyes, and capable of being cultivated for that purpose. The colours they yield are more or less valued for their permanence and beauty.

XI.—PLANTS CULTIVATED FOR THEIR SUGAR.

A GREAT variety of plants are either cultivated or admit of cultivation for their sugars. Among them the following may be enumerated. The sap of the birch, sycamore, bamboo, maize, parsnep, cow-parsnep, American aloe, dulse, walnut-tree, cocoanut-tree; from the fruit of the common arbutus, and other sweet tasted fruits; from the various species of the grape; from the roots of the turnip, the carrot and the parsley; from the flower of the Euxine rhodendron, and from the nectary of most other flowers. These have all been tried in Europe, sometimes by way of experiment, but more frequently from necessity. They have, however, given way entirely to the three following named plants, from which alone sugar is now extracted to any considerable amount. 1. The Sugar Cane, *Saccharum officinarum.* 2. The Sugar Maple, *Acer saccharinum.* 3. Sugar Beet, *Beta cicla et vulgaris.*

I. THE SUGAR CANE.

THE sugar cane is a native both of the islands and the continent of America,* as well as the East Indies. It was known to the Greeks and Romans. Sugar and the sugar-reed are mentioned in the most ancient records that have been handed down to us—first mentioned by PAUL EGINETA, a physician. It was made known by the conquests of ALEXANDER THE GREAT; and STRABO relates that it was found in the East Indies, three hundred and twenty-five years before the coming of CHRIST. That celebrated Roman farmer, VARRO, a few of whose works on agriculture have been handed down, though greatly mutilated, refers to it sixty-eight years B. C., as a fluid pressed from reeds of a large size, sweeter than honey. It was, no doubt, introduced into Europe during the *Crusades*—expeditions, which, however romantic in their plan, and unsuccessful in their execution, were productive of great advan-

* The sugar cane was found growing luxuriantly when COLUMBUS first discovered this country. We have the testimony also of PETER MARTYR, in the third book of his First Decade, written during the second voyage of Columbus, 1493, 1495; it appears that the sugar cane was known at that period in Hispaniola.

tages to the nations of Europe. To the Crusades the world is indebted for the modern manufacture and commerce of sugar.

Its cultivation in Spain is referred to by some old writers as early as the year A. D. 1052; and it was said of Tyre in Syria, in the year 1169, that "that city was famous for excellent sugar." It was produced in Sicily, in 1148; in Madeira, 1419; in the Canary Islands, 1503. White sugar made its first appearance it is said, at Vienna, in 1333; and is mentioned as one of the heaviest items in household expenditures; four years previous to this, loaves of sugar were sold in Scotland at one ounce of pure silver per pound, rather more than four dollars of our money at the present day. The business of cultivating the cane, and the manufacture of the sugar, was commenced in good earnest by the English, in 1643, who had previously settled the Island of Barbadoes. Their neighbours, the French, were not far behind, as we find them entering into the business, in 1648, in the Island of Gaudaloupe, on the grand scale.

The culture and fabrication of sugar being found profitable, the Dutch, Spaniards, and Portuguese entered largely into the *new* trade, and every island, of which they had severally become possessed, by the late discovery, suitable for its culture, was appropriated to it, and the unhappy inhabitants, in many instances, compelled to act the part of slaves in its fabrication. In 1518–19, St. Domingo contained fifty-seven cane plantations, and twenty-eight sugar presses. But in the short space of sixty years, if our authority is correct, we find this one island, exporting to Europe, the almost incredible amount of sixty-five thousand tons of sugar per annum!

It cannot, however, stand the cold of high latitudes. The zone of its cultivation extends to about 35° on either side of the equator—this is the most suitable range. Although it has been cultivated, and in some instances successfully, between the thirty-fifth and fortieth degrees of latitude.

II. THE SUGAR MAPLE.

The sugar-maple, *Acer saccharinum*, is one of the innumerable marvels of the American forest, extending over a vast tract of country, from the 36th to the 48th degree of latitude, and in longitude half the width of the continent. No tree, with the exception of perhaps the oak and pine, has obtained a more extensive and just celebrity than the sugar-maple. The extraordinary neatness of its appearance, and the beauty of its foliage, which in summer is of the liveliest green, and in autumn assumes the richest and most glowing red, are abundantly sufficient to recommend it as a beautiful ornament in our gardens and avenues.

The branches of the sugar-maple exhibits great regularity, without stiffness, and are so arranged, that their usual outline is an elegant oval. The bark is remarkably smooth. It is a tree of tolerably quick growth—bears transplanting very well—and will grow on almost any soil. The most reckless prodigality has been manifested in the destruction of this valuable tree; in very many sections of our country, whole groves have been felled for no other purpose than the *ashes* obtained from the burning of the trees. It is stated, on good authority, (1834,) that three-fourths of the pot and pearl ashes made in this country, and which forms so important an article of export from the northern states, is manufactured from the ashes of the sugar-maple. But this destructive system, is now, in a great measure, checked; and it has become a matter of serious importance to the farmers residing within the limits of its growth, to perpetuate and extend it.*

This can be easily accomplished. They may be set out as ornamental and shade trees, around the farm-house, along the avenues, and in clusters in fields where shade is occasionally required; or, the farmer may set apart three, four, or more acres of land for a sugar orchard. The trees may be planted in rows, ten feet apart; and the same interval of ten feet between the rows. This gives four hundred and sixteen trees to an acre. The trees may be procured in abundance in any forest where the sugar-maple grows spontaneously. Those who plant *now*, will generally plant for posterity; but there are many young farmers, who, if they would address themselves to it immediately, would probably reap some benefit from such a plantation in their own time, and the advantages that would result to posterity would be very great. SAMUEL M. HOPKINS, Esq., President of the Agricultural Society of Genesee county, New York, says, and he cites a case in point, that a person, after attaining the age of manhood, may raise, even from the seed or sucker, an orchard of maples, from which sugar may be made twenty years or more, within the possible duration of his life.

Mr. HOPKINS states that young maples, taken up in the woods and transplanted, may probably be tapped without injury in from ten to fifteen years. He is of opinion, that forty trees, of the largest growth—that is, one for every four rods of ground—are sufficient for an acre, though he does not object to eighty,

* Genesee Farmer, vol. ii. p. 233.—N. A. Review, April, 1837.

or even double that number. The trees will injure the land very little, if any, either for pasturage or meadow, till they themselves become productive—and very trifling afterward, provided the trees are not set too close.

The rapidity of the growth of young trees when transplanted, depends very essentially on the manner of performing that operation. The greater the depth and superficial extent to which the ground is loosened, round where a young plant is to be set, the more rapid will be its growth. Let, for instance, a young tree be set in a hole only eighteen inches diameter, and a foot in depth—and let another, in all respects similar, be set in a space six feet wide and two feet deep, and the latter will, for many succeeding years, grow with double the rapidity of the former. In order, therefore, to give the young maple a rapid start, so as to have them soon in a condition to afford large supplies of sap, due attention must be paid to this particular. Let the spaces for the trees be dug a foot in depth and five feet in diameter, and then spade, prong, or loosen the bottom of each hole, to the depth of about a foot, before the young trees are set in.*

In addition to planting maples in grounds intended as permanent pasture or meadow land, each side of the highway leading through any farm might be profitably occupied and adorned with these trees, set at the distance of about every two rods. Suppose, also, that the farm-house were placed in a spacious court-yard—occupying an acre in extent—and this planted with a suitable number of this most beautiful and ornamental tree, could any thing confer more of an air of pleasantness and elegance to the mansion. Every farmer might, in this way, stock his lands with a permanent growth that would in time afford him an abundant supply of sugar—plentiful additions of fuel—and eminently serve as an embellishment to his domain.

There is on almost every hill farm, some place favourable to the growth of a maple orchard—some rocky spot, yielding but little grass, and impervious to the plough. Such spots may be favourably chosen for the growth of a maple orchard—and whether the increase be used for the manufacturing of sugar and molasses, or for timber or fuel, the proprietor will find a profit better than money at interest in the growth of this beautiful tree, which will spontaneously propagate itself in various positions. The second growth is very rapid, becoming of a proper size, in many instances, of producing sugar in ten to fifteen years; the sap of the second growth having been found to yield a larger proportion of saccharine than the original forest

* The Plough Boy, vol. i., page 379.

trees. As an article of fuel, its wood equals the solid hickory.*

The increased consumption of sugar within the last century, is really astonishing; and so nutritive, wholesome and agreeable,—universally acceptable to the infant and the aged—the civilized and the savage,—no possible limit can be set to its consumption. The population of the sugar growing countries —now that Europe is recognised as such by the late, but very extensive fabrication of sugar from the beet root—is estimated at four hundred and sixty-eight million souls. The great traveller and naturalist, HUMBOLDT, states, that in Mexico the consumption is ten pounds per year to each inhabitant. The estimated consumption in England is set down at twenty-four pounds to an inhabitant; in Ireland, five; in Scotland, six and a half; in Belgium, seven; in Holland, seventeen; in Spain, four and a half; and in Portugal the same; France and Germany, at present the great beet-sugar manufacturing countries, are large consumers, the average of the former being seven pounds to an inhabitant; of the latter, five and a half. The total annual consumption of sugar in Europe, is one thousand million two hundred and sixty-seven pounds; of which one hundred and forty million, or sixty-two thousand five hundred tons, are beet-sugar. The total annual consumption throughout the world, is set down at six thousand two hundred and sixty-seven million pounds—worth, at six cents a pound, three hundred and seventy-six million and twenty thousand dollars; two hundred million pounds are probably consumed in the United States, which will give to each individual sixteen pounds per annum. Our domestic production—which has rarely proved profitable —is estimated at fifty thousand hogsheads, or fifty million of pounds,† to which may be added from ten to fifteen tons of the maple-sugar. In 1837, the sugar *imported* into the United States amounted to one hundred and thirty-six million one hundred and forty-nine thousand seven hundred and sixty-one pounds. In the same year, the *exports* to forty million one hundred and twenty-four thousand eight hundred and nine pounds, leaving a balance against us of ninety-six million fourteen thousand nine hundred and fifty-two pounds.

The amount of sugar consumed is almost incredible. The aggregate quantity *imported* for the seven years ending September 30, 1831, was five hundred and thirty-six million three hundred and sixty-three thousand five hundred and ninety-two pounds; and in the seven years preceding Septem-

* Hon. ISAAC HILL, governor of New Hampshire.

† In 1839 the cane-sugar manufactured in Louisiana and Mississippi alone, exceeded forty thousand hogsheads.

ber 30, 1835, the aggregate amount was six hundred and sixty-four million three hundred and seventy-one thousand five hundred and eight pounds. The quantity imported for the year ending September 30, 1837, was one hundred and thirty-six million one hundred and forty-one thousand three hundred and thirty-two pounds; and all this is exclusive of the home manufacture, that from the cane alone amounting to one hundred thousand hogsheads per annum, besides that made from other materials. The quantity of sugar *exported* for the year ending 1837, according to the treasurer's report, was forty-one million fifty-nine thousand seven hundred and ten pounds, of all kinds. The quantity of molasses *imported* during the year 1837, was sixteen million four hundred and fifty-one thousand one hundred and eighty-two gallons.

These facts are cited simply to show to the farmer residing within the zone of the maple, that sugar, which is one of the most nourishing substances in nature, will always be in demand; and that, inasmuch as sugar from the maple is easily fabricated—requires no attention except at the time of manufacturing—that with care in its manufacture and after processes it may be rendered equal to the best productions of the cane or beet, command a fair price, and of course be rendered profitable—that it is the interest of the farmer to protect the trees now remaining, and also to set out others, as described in the preceding paragraphs. While doing this, he not only adds greatly to the beauty of his domain, but also to its prospective value. Besides, the sugar is made usually at a season in which it does not interfere with the ordinary operations of the farm.

The fabrication of sugar from the sap of the maple, is a simple process. But the whole business should be managed with the utmost *cleanliness*. A great objection heretofore urged against the use of it generally, and which has for years past given it a bad repute, is the very slovenly manner in which it is manufactured—and its dark and dirty appearance would deter many from purchasing. There has been much bad practice and wrong management. But it does not follow that it must necessarily continue.

The process of fabricating the sugar, according to the most approved method, is thus stated by the Hon. Isaac Hill, of New Hampshire.

The work begins usually about the first of March. The tree will yield the liquid long before vegetation appears from the bud: frequently the most copious flow is before the snow disappears from the ground. The clear day following a night of freezing is the best time for running sap. Some persons have a camp in their maple orchards where large cauldrons are set in which to boil down the sap to the consistency of a thick syrup: others take the liquid to their houses and there boil down and sugar off. The process begins by the preparation of spouts and troughs or tubs for the trees: the spouts or tubes are made of elder, sumac, or pine, sharpened to fit an auger hole of about three-fourths of an inch in diameter. The hole is bored a little upward, at the distance horizontally of five or six inches apart, and about twenty inches from the ground, on the south or sunny side of the tree. The trough, cut from white maple, pine, ash or basswood, is set directly under the spouts, the points of which are so constructed as completely to fill the hole in the tree, and prevent the loss of the sap at the edges, having a small gimlet or pith hole in the centre, through which the entire juice discharged from the tree runs, and is all saved in the vessels below. The distance bored into the tree is only about one half inch, to give the best run of sap. The method of boring is far better for the preservation of the tree than boxing, or cutting a hole with an axe, from the lower edge of which the juice is directed by a spout to the trough or tub prepared to receive it. [The latter method, boxing, is highly injurious, and ought never to be adopted.] The tub should be of ash, or other wood that will communicate no vicious taste to the liquid or sugar.

The sap is gathered daily from the trees and put in larger tubs for the purpose of boiling down. This is done by the process of a steady hot fire. The surface of the boiling kettle is from time to time cleansed by a skimmer. The liquid is prevented from boiling over by the suspension of a small piece of fat pork at the proper point. Fresh additions of sap are made as the volume boils away. When down to a syrup, the liquor is set away in some earthen or metal vessel till it becomes cool and settled. Again the purest part is drawn off or poured into a kettle until the vessel is two-thirds full. By a brisk and continual fire the syrup is further reduced in volume to a degree of consistence best taught by a little experience, when it is either put into moulds to become hard as it is cooled or stirred until it shall be grained into sugar. The right point of time to take it away from the fire may be ascertained by cooling and graining a small quantity. The sediment is strained off and boiled down to make molasses.

A cold and dry winter is followed with a greater yield of sugar from the maple than a season very moist and variable. Trees growing in wet places will yield more sap, but much less sugar from the same quantity, than trees on more elevated and drier ground. The red and white maple will yield sap, but it has much less of the saccharine quality than the rock or sugar maple.

As this is made at a season interfering very little with the other business of the farm, the sugar that the farmer makes is as so much clear gain.

A spoonful of slaked lime to a half barrel of sap is beneficial, it causes the impurities to rise more readily when boiling. Fermentation of the sap usually takes place in about thirty-six hours; and unless some method is devised of preserving it, it should be boiled without delay. When reduced to syrup it is to be strained through a woollen cloth, hair cloth will answer as well, and stand for a few hours to settle. In boiling down, charcoal is the best fuel to use. The *clarifying* materials should be added at the commencement of this process, (boiling down.) These are generally milk, eggs, or what is better, calves blood. The scum which rises should be carefully removed. The syrup, when properly reduced, is taken from the fire, and stirred for some time in order to give it *grain*, which is thus easily effected by bringing every part into contact with the atmosphere. This is a very important part of the process, for if it is not stirred, but poured into the moulds, it will not be grained, but resemble candy rather than sugar. Molasses and vinegar are generally made from the last runnings, the sap being less adapted for sugar. The molasses, when properly clarified, is superior to that from the sugar-cane, having a peculiarly grateful flavour. The vinegar, though excellent for ordinary use, is not well adapted for pickles.*

Claying or whitening the sugar. In two or three days after the moulds or tubs are unstopped at the bottom, mix white clay with water, so as to reduce it to a thin mortar. With this cover the top of the sugar one inch and a half thick; when the covering appears dry, remove it, and supply its place by a

* We believe it is not used in the arts.

fresh covering two inches thick. This process may reduce the sugar one-fifth, but it adds correspondingly to the molasses.—*Jesse Buel, Esq., in Cultivator*, vol. i. page 5.

Trees should always be tapped on the south side first—as the season advances, on the east and west side—and lastly on the north. The duration of the sugar making season is generally about a month. When the weather becomes warm, rinse out the buckets with lime water frequently, as it will prevent the sap from souring.

An intelligent writer in the Genesee Farmer, who appears to have devoted much attention to this subject, gives the following account of the improvements recently made in the fabrication of this article:

The first improvement is in the manner of tapping and gathering the sap. The trees are tapped with a half inch screw bit, bored not to exceed an inch and a half deep—two holes, one about three inches higher than the other, so that the spout need not interfere with the emptying of the bucket. The spouts are made of soft maple or ash, turned and bored in a lathe—the one for the lower hole is three inches long, quite tapering, with a crack near the end for holding a wire with which the bucket is suspended—the upper one six inches long, made in the usual manner. The buckets are large, holding from twelve to sixteen quarts, and suspended from the short spout by a wire or string, so that it will swing, and may be emptied without taking off. The advantages of having the buckets suspended from the spouts are, that you catch all the sap, the buckets are not found wrong end up when you have a good run, and a great saving of labour in the gathering. The spouts are durable, lasting, with proper care, as long as the buckets.

The next and most important improvement is in the *boiling*. Instead of three kettles, between two logs, the smoke and ashes flying every way, we have sheet-iron pans of a size corresponding with the number of trees. For a plantation of from one hundred and fifty to two hundred trees, a pan of six feet long, three feet wide, and nine inches deep, would be of a suitable size. This pan is set upon an arch of brick-work, so that the fire extends the whole length of the bottom, and does not touch the sides or ends—therefore they are not liable to burn—a large surface is thus exposed for evaporation, and they will boil off the sap much faster than cauldrons or kettles containing the same quantity. Besides, they are much neater, less in the way, and cheaper. They are made of common sheet-iron riveted together. [Copper would answer a better purpose, especially where sugar is made in large quantities. It gives out heat with much greater rapidity than iron.*] Another improvement is in having suitable buildings, properly fitted up with all the necessary apparatus for conducting the business with facility and convenience—such as reservoirs, buckets, boilers, &c.

Willis Gaylord, Esq., of Otisco, New York, one of the most intelligent and successful agriculturists of that great state, in speaking of the proper period of making sugar from the maple, which depends almost entirely on the forwardness of the spring, usually varying from the first to the fifteenth of March, says:

In order that the sap may flow freely, the frost must be mostly out of the ground, and a degree of warmth, sufficient to cause the minute vessels in the

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* To make the experiment, take two bars, one of iron the other of copper, of equal length and circumference; place them in the fire, retaining an end of each in your hand, you will find the heat is communicated to your hand by the copper bar some minutes in advance of the other.

tree tops to expand rapidly, must exist in the air. The number of trees to be tapped, depends on the means of disposing of the sap nearly as fast as it flows, and on the quantity of sugar it is intended to make. In ordinary seasons four pounds to a tree will not be too high an estimate.

The sap should be boiled away immediately after it is gathered from the trees. The buckets, the receivers, the kettles, should all be kept scrupulously neat and sweet. The sap and the syrup, when boiling, should be carefully scummed and cleansed. Two quarts of milk, stirred into the syrup when cold, and the whole gradually raised to boiling, will completely cleanse a quantity of syrup sufficient to produce thirty-five pounds of sugar. After the addition of the milk the syrup should not be agitated in the least, until the impure mass has risen to the surface, and is ready to be removed by skimming. Lime is used as a corrector of the gallic acid, which at an advanced period of the sugar season, or when the sap has stood for some time, renders the conversion of the syrup into sugar impossible. For this the lime is a corrector. If more sap is gathered than can be boiled down at the time, it is to be stored in a large tub or reservoir, under cover; and a handful of lime is occasionally thrown into it, and when necessary stirred up. A handful of lime will be sufficient for several barrels of sap, if applied often. It is recommended to wash all the utensils frequently with a preparation of lime-water.*

III. THE SUGAR-BEET.

The beet is now cultivated largely in France, and throughout the north of Europe, for its sugar. The sugar produced, when crystallized—which is easily effected, provided the quantity of syrup operated on is sufficiently large—is then no way inferior to that derived from the sugar-cane. The fact that crystallized sugar could be obtained from the beet-root, was first noticed by Margraff in 1747, but excited little or no attention until 1790, when Achard, a German chemist, directed the men of science in France to that subject. The success which now attends the culture of the beet, and the fabrication of sugar in France, owes its origin to the plans of Napoleon, to render his empire independent of the sugar commerce. After the downfall of that great captain, and the restoration of the Bourbons, its manufacture was encouraged by a system of fiscal regulations, imposing a somewhat onerous duty on importations—with a shade of difference in favour of

* Genesee Farmer, vol. iv. p. 91.

that imported from the French sugar islands. But such has been the vast increase of its manufacture—affecting the revenue of the empire by lessening its receipts at the customs—and a desire on the part of the French government to uphold the interests of the sugar islands, that a heavy tax has been imposed on the domestic manufacture.

Sugar from the beet, of a very superior quality, has been made at different periods and in various sections of the Union. To manufacture sugar from the beet root to a profit, the business must be conducted on the *grand scale.* No doubt is entertained, however, that in process of time, the business will be so far simplified, as to constitute an article of household fabrication. But at the present period this is not desirable: and if the manufacture of sugar from the beet should, with us, prove a total failure, still the benefits arising from its introduction and extensive culture of the beet throughout the Union, are incalculable. Accomplishing for this country what the turnip culture did for England. But that the manufacture of the beet-sugar, will ere long become general and profitable, is as certain as that the beet will grow. We would not, however, advise the farmer to give the least attention to its fabrication, especially under present circumstances. He will find it of far greater advantage to feed the roots to his stock, thereby increasing his manure—and in the event of factories being established in his neighbourhood, supplying them with the products of his farm.

The following comprehensive account of the process of manufacturing sugar from the beet, is from the pen of James Pedder, Esq. He is familiar with the whole system. It will be found as valuable as it is interesting.

The manufacture of sugar consists of seven distinct processes.

1. *Cleaning the Roots.* In many large factories this is done by washing in long wooden cylinders, with open sides, which revolve by the power of steam in cisterns of water: the roots are thrown in at one end of this cylinder and are carried round and ejected at the other by a spiral or Archimedes' screw; and if the work could be effectually performed by these means, it would be a great saving of expense, but the fact is, it is at best a most inefficient mode. If the roots have been grown on a stiff soil, quantities of earth will still be found adhering to them, maugre all your attempts to free them from it. This will do great injury to the teeth of the rasp while crushing, and will, I presume, be of no value in the cake as food for sheep or cattle. The large roots are often found to be hollow and partially decayed at the crown; this putrid matter being acetous, is peculiarly destructive to the yield of saccharine, and no washing will remove it. The end of the tap root and the lateral fibres are almost useless to the production of sugar—often very injurious; I therefore prefer to clean by scraping with a knife, when the earth and decayed parts are easily removed: the cuttings are greedily devoured by cattle and hogs, and that portion only of the root is used which is best calculated to yield a superior quality of sugar.

2. *Crushing or rasping the Roots.* In no manufactory, except where maceration is practised, is this process performed by any other means than by the

rasp. This is a wooden barrel, set transversely with steel saws at half an inch apart. It is 13½ inches wide, and 23 inches diameter, and when propelled by steam, makes about 900 revolutions in a minute, crushing into impalpable pulp 90 pounds of roots in that space of time. Pressing by cylinders has often been tried, but found to be totally inapplicable to the purpose.

3. *Pressing the Pulp.* The heat engendered by the process of rasping brings on instantaneous fermentation, which is destructive to the yield of sugar: no time is therefore lost in submitting the pulp to the action of the press, by which the juice is extracted in a surprisingly short space of time. In no instance did I witness this operation performed by any but hydraulic* pressure, the power of which is astonishingly great. The machine for this purpose is very expensive, but when obtained, the saving of labour and time is great. The pulp falls from the rasp into a square box below, from whence it is taken in a deep *wooden* or *copper* shovel, and put into a bag which is held open for its reception; it is then placed upon a frame of wicker work, standing upon a small hand-barrow resting upon wheels, where it is spread evenly in the bag, and the mouth is then turned down to prevent the escape of the pulp while under the press; it is then covered by another wicker frame and another bag, until the pile consists of thirty-five bags and wicker frames. The whole is then removed to the press, where a man takes and deposites them on the wooden platform, which sets on the bed of the press, and the pressure is then applied. So soon as the juice is extracted, the pressure is taken off, the bags are emptied of the dry cakes, and the press is ready for another load. These presses are always worked in pairs, so that while one is pressing, the other is being loaded. The juice flows from the press into a cistern beneath the floor, from whence it is immediately pumped into the desiccating pan, which is placed so high, that the contents might flow from it by a pipe, into the evaporator.

4. *Desiccation.* The desiccator is a copper pan, into which the juice is pumped, so as to fill it within four inches of the top, when heat is applied, either by means of steam or fire. As soon as the juice has attained the heat of 58° Reaumur (162½° Fahrenheit) lime is added in exact proportion to the acid contained in it, which is ascertained by chemical tests. This lime is prepared by slaking with *hot* water and mixing, so as to be of the consistence of cream, and when it is added, the greatest care is taken to mix it most intimately with the juice, by stirring with a wooden spatula: after this, it is suffered to rest, and the heat is raised to the boiling point, when it is suddenly checked by withdrawing the steam or fire; as soon as the juice has become perfectly clear, it is run off into the first evaporator, taking care that none of the scum, or sediment at the bottom of the pan passes with it. The scum and sediment is then collected, put into bags and pressed, to obtain all the juice it contains; after which, the residuum is thrown to the dunghill, a valuable manure.

5. *Evaporation.* The evaporator is a copper pan, into which the clear defficated liquor flows, until the pan is about a third part full; to this, a small quantity of animal charcoal is added, and the fire or steam is applied; here it is boiled until it marks 21° by the saccharometer, when it is passed into a receiver, from whence it flows into the clarifiers for purification. During the boiling, if the juice rises in the pan so as to threaten to overflow, a small quantity of tallow is added, which causes an immediate subsidence, and facilitates evaporation.

6. *Clarifying.* The clarifiers are wooden or copper pans, 2 feet 8 inches deep, 20 inches diameter at top, 11 inches diameter at bottom, each with a small brass cock near the bottom. A copper strainer standing on three feet and covered with canvass, is placed in the bottom of each clarifier, which is then filled with granulated animal charcoal, (about 100 lbs. in each pan,) and is covered with another copper strainer and cloth, and then the syrup is permitted to flow upon it until the pan is full. After it has stood some time, the cock is opened, the syrup is permitted to flow slowly into a cistern, and the pans are refilled as fast as they empty. From the cistern the syrup is pumped

* The great variety of power presses to be obtained in this country, at comparatively small cost, will obviate the necessity of always using the hydraulic press.—*Pub. Com.*

into the condenser, for a last evaporation. These clarifiers are emptied of their animal carbon twice in the day, and filled with other, fresh burnt from the kilns. It is found that some of the saccharine remains in this carbon, it is therefore put up to receive the juice from the desiccator as it passes into the first evaporator, by which means the saccharine is extracted; after which, the animal carbon is turned out to be washed preparatory to another calcination, whereby it is rendered fit for farther use, *ad infinitum.*

7. *Concentration.* The clarified syrup is evaporated in the condenser to 41°, (by saccharometer,) at which point it indicates signs of fitness for crystallization, which may be known by the usual test, drawing between the finger and thumb, when if the thread break and the end draws up to the finger in a kind of horny substance, it is enough. Another mode is, to blow through the holes of the skimmer, when if the syrup be sufficiently tenacious to form air bubbles and fall to the ground, and on bursting leave a white substance, it is immediately removed from the fire.

At the commencement of the crushing season, and when the roots are fresh and good, four pounds of lime will be found sufficient for the desiccation of 8½ hectolitres,* (225 gallons,) but as the season advances, more lime will be required, until at length, at the conclusion of the season, and when vegetation has commenced, as much as 7, and even 8 lbs., have been found necessary to effect the purpose; in this case there is danger of an excess of lime, which is taken up by means of acid, applied at the time of condensing the syrup for the last time. Sulphuric acid, reduced by water in the proportion of 44 water to 1 of acid, is used for this purpose, the exact quantity necessary must be judged of by chemical test; if more is used than is proper to neutralize the lime, the refiners of the sugar object to purchase, as it subjects them to much inconvenience, and some loss; practice, however, soon makes perfect this part of the business. When the concentration has been carried to the crystallizing point, the syrup is poured into large copper pans, which are placed in the air, where it remains about two hours, to cool, during this time it is stirred occasionally, that the cooling might go on regularly; it is then poured into flat pans made of tinned iron, 2 feet 3 inches long, 15 inches wide, and 3½ inches deep, and is then left to crystallize, in a cool atmosphere, for 12 hours and sometimes more. These pans are then removed to the stove, and set on their ends that the molasses may drain from them, and in 12 days from the making, the sugar is fit for the market. On removing the sugar from these pans, about one-tenth of the contents is found at the bottom edges to contain molasses, and must be separated from the cake, this is mixed with the molasses which has drained from the pans, is reduced to 17°, (by saccharometer,) with water, evaporated to 21°, and is again submitted to the clarifying process; after which it is concentrated to 41°, (by saccharometer,) for the purpose of making sugar of second quality, which, if well done, is equal in value, for the purpose of refining, to sugar of first quality. When this syrup of second quality is sufficiently concentrated for crystallizing, it is poured into the coolers, and from them removed to cone-shaped earthen pans, and placed, first in the cool, and afterwards removed to the stove; at the end of about 24 hours the stoppers are removed from these pans, and the molasses permitted to flow away, and in about six weeks from this time, the sugar from these pans is fit for the market. On removing these loaves from the pans, a portion near the holes will be found to contain a considerable portion of molasses mixed with sugar; these portions are collected and reduced by water to 17°, (by saccharometer,) and boiled to 21°, when the syrup is passed through the clarifying pans, and concentrated for crystallizing, as above. During the boiling to 21°, large quantities of scum will arise, which must be carefully removed: this scum is to be washed with water, to obtain from it all the saccharine, and this water is then used to reduce the impure sugar, from the pans, so that nothing be lost. From the molasses of these pans of second quality sugar, there may be extracted sugar of third quality, but the labour and expense of fuel for evaporation, together with the great length of time which it requires to perfect crystalliza-

* The hectolitre is 105 6-10 quarts.

tion, sometimes a whole year, I am convinced it will be, in this country, far more profitable to obtain the result in the *shape* of *beef and mutton*, than in sugar.

The Vine, *Vitis vinifera*, and other species of grape, yield sugar. But they are rarely, if ever, cultivated for this purpose; for, while they are inferior to other plants for the production of sugar, they are superior to any for the special purpose for which they are cultivated—the production of wine.

The Birch, *Betula alba*, when its stem is perforated, yields a large quantity of juice, from which sugar may be obtained by boiling. The inhabitants of some countries where the birch abounds, supply themselves in this manner with a species of domestic sugar.

XII.—PLANTS CULTIVATED FOR THEIR NARCOTIC, BITTER AND TANNIN PRINCIPLE.

I. TOBACCO.

Of the plants which afford the narcotic principle, the most important are the tobacco and the poppy, the former of which is very extensively cultivated in some parts of this country as an article of commerce. The home consumption of tobacco is immense. The discovery of this plant is supposed to have been made by Fernando Cortes, in Yucatan, in the Gulf of Mexico, where he found it used universally, and held in a species of veneration, by the simple natives. He made himself acquainted with the uses and supposed virtues of the plant, and the manner of cultivating it, and sent plants to Spain, as part of the spoils and treasures of his new found world.

The Portuguese, however, were mainly instrumental in diffusing the tobacco plant over Europe and the east. It was introduced into France from Portugal, in the year 1560, by John Nicot, after whom the plant is named—*Nicotiana.* The history of the introduction of this plant into various countries, is very remarkable. It is known that this plant, seemingly nauseous, has in spite of the most powerful opposition—in the face of pains and penalties imposed by legislative enactments—taken deep root, as it were, in every country; so that, at the present time, it appears to have become apparently essential to the comfort of the inhabitants. It required a long series of unjust and intemperate laws to arrest its progress in England, and its culture there is now directly prohibited, on account of the great revenue derived from the importation of the foreign commodity. This system is wrong; and the English nation will ere long see its utter fallacy.

The species almost every where cultivated in America, is the *N. Tabácum*, or Virginia tobacco. It grows in all the temperate zones to a high latitude. It is cultivated extensively in Germany, France, and the low countries—in Sweden, Russia, and other parts of Europe—in some parts of Asia, and the islands that fringe its coast. The annual species may be grown in every country and climate; for every country has a summer, and that is the season of life for annual plants: but in such countries it can never be made an object of profitable and extensive culture.

The tobacco plant requires a rich light *soil*, and its cultivation is attended with considerable labour of detail. The *seeds*, which are very minute, are generally sown in a sheltered place, covered during the night to defend them from frosts, and in the end of May, or beginning of June, transplanted to the fields, and set in rows at a sufficient distance from one another. The *after culture* consists in keeping the ground free of weeds, removing insects and injured leaves, and picking off the summits and buds, to prevent the flowering of the plant, and to direct the nourishment to the leaves. When the leaves are ready, the stems are cut over, the plants hung up and dried, and then put into heaps for the purpose of undergoing a certain degree of fermentation. They are again hung up, the leaves being separated from the stems, and made to undergo a second fermentation, under a certain degree of pressure. The leaves are again dried and tied together in bundles. They are then packed and compressed in casks for sale or exportation, which completes the task of the grower.

Culture of the Tobacco. The following dissertation on the method of raising tobacco, was, by request, laid before the Kentucky State Agricultural Society, by John Johnson, Esq., who, it is said, is a very successful and experienced cultivator. He says:

Tobacco has been for several years an article of profit to the grower, and perhaps as much so to the farmers of our state as any other; and from the peculiarity of our soil, is likely to be a production of Kentucky much longer than many of the less fertile eastern states. As tobacco is a crop that requires more experience than almost any other, I will commence with the first step in the crop, viz: Plants. Plants should be sown in February or March, upon a light or mellow natural soil, care being taken not to sow them too thick. The bed on which they are sown should be burned sufficiently to destroy all indigenous herbage. The grounds upon which the tobacco crop is to be raised, should be prepared first, by coultering and ploughing, if newly cleared, or by ploughing only, if clear of roots; secondly, by bedding or throwing three or four furrows (according to the size of the plough) together, and hilling. The hills should be about three inches above the surface, and about three and a half feet distant from each other, or if the land produces luxuriantly, mow in order to give room to pass along the rows without breaking the tobacco.

It is not essential as many suppose, to make land very loose for tobacco. Breaking the land one and a half or two inches deep, is sufficient, care being taken to make the hills loose where the plants are to be placed when transplanted. Roots in new land are no great obstacle, as it is not essential to use the plough the first year, three workings with the hoe being sufficient. Old land should be stirred oftener, as it is much more disposed to bake or become hard. The culture of tobacco is trifling compared with the other part of the process of rendering it marketable. After the hills have been made as before described and planted, the first work should be done with hoes, by scraping the earth and herbage, then springing up, into the middle of the row, forming a ridge somewhat like that formed by running two furrows in a corn row with the bar of the plough next the corn. If the indigenous growth be of such a nature as not to be easily destroyed, it is advisable, after using the hoe, to run two furrows with a plough skirting the hills and lapping the earth from the mole of the plough in the middle of the rows, covering the ridge made by the scraping with the hoe. After this, the middle of the rows should be ploughed out, and the earth thrown around the plants, forming an addition to the hills. The third hoeing, or ploughing if the ground be baked, should be made before the tobacco is of a size large enough to top, which should be done as soon as the plants will admit of being primed, (that is, the leaves taken off,) to the height of four or five inches, and leave a sufficient number of leaves to top as high as is designed, say on a tolerable soil, fourteen leaves for the first or largest plants; the next at twelve, gradually diminishing as the season advances.

Cutting, housing and curing, are the most difficult parts of tobacco growing. It should not be cut while the sun is shining very hot, by which it is very much bruished in handling, if not burned and rendered lifeless. Care must be taken not to put too many plants on a stick, varying from eight to ten in proportion to the size of the tobacco. Neither must it be crowded in the house, by which it is much injured, called *house burn.* Tobacco should be fired as soon as it becomes of a permanently yellow colour, which varies from ten to fifteen days, by slow fires, and not so as to coddle or cure it in a few hours. It would be better to continue the process twenty-four or forty-eight hours with a moderate heat, having the house tight up to the first tier, but sufficiently open above for the heat and vapour, generated from the green tobacco, to escape. After tobacco is cured, in long continuations of damp weather, it should be fired sufficiently to dry and keep it from moulding. The temperature of tobacco for pressing, should be as dry as it can be handled without breaking.

From observation, I am induced to believe that land of the second quality, pretty much elevated and of an argillaceous nature, whether new or old, is best adapted to raising tobacco of a superior quality; first, because such land does not put forth vegetation as rapidly as a richer and warmer soil, and thereby the tobacco acquires that fineness of texture and small fibres for which it is much valued; secondly, such land will admit of the crop standing much longer after commencing to ripen, by which it acquires the great variety of shades in colour, another admired quality; and lastly, the slow growth of such a soil, prevents that abundance of sap or juice, produced by a quick growth, which materially injures this plant in curing. It also gives a stamina to the leaf, making it much tougher than the quick growth. But a very beautiful tobacco is produced upon silicious soils, though without much, if any, variegation of colour, its colour being of a bright amber; and another kind, of a dark nutmeg colour, is produced by the first quality of our uplands; the second and third kinds are produced by the calcareous uplands of our state.

Land should be of sufficient strength to produce forty bushels of Indian corn to the acre, to raise good tobacco. And I would fix upon that as the medium strength, an addition of much extent, would make the fibres coarse and the growth too luxuriant. Much less, would not produce a sufficient crop to pay the expense of cultivation, (though perhaps the quality might be better,) unless a greater difference were made by purchasers in the different classes of tobacco. Land that requires manure, should, as before stated, be of an argillaceous nature. The best manure is that of decayed vegetable substances—wheat straw being one of the finest manures I have ever tried; the straw has a tendency to give tobacco that variegation of colour before mentioned. Stable manure does not answer so well. It gives a dark greenish colour, makes the growth too luxuriant and the fibres too large.

The best method of manuring is, to scatter the manure before breaking the ground, as it is thereby thoroughly mixed with the earth, and is deprived of its burning or heating effects in a dry season; when put in the hills it causes a dirth by heating and absorbing the moisture. I have for many years tended the long green tobacco. I have also grown the Blue Prior, Big and Little Frederick. But of the four varieties, I prefer the first, it not being so subject to speck or black in spots while ripening.

Produce. The returns on a good soil, favourable season, and attentive culture, will generally reach one thousand pounds to the acre, in Maryland and Virginia; but on the fresh rich lands of the south-western states, the crop not unfrequently reaches fifteen hundred pounds. The average throughout the tobacco-growing districts, will probably reach a "hogshead" weighing thirteen hundred and fifty pounds, which is a good crop, and affording sufficient employment for one hand.

To save the seed allow a few of the strongest plants to produce their flowers; they will have a most beautiful appearance in July and August, and in a favourable season, each plant will ripen in September as much seed as may be necessary for sowing a quarter of an acre, by the drill system of culture, or stock half a dozen acres by transplanting. The large plants require about a square yard each; and in general, four plants will yield a pound of tobacco, though very rich land will yield double the quantity. The *diseases and enemies* to which this plant is liable, are, in the language of the planter, "worm-holes, ripe-shot or sun-burnt, moon-burnt, house-burnt, stunted in the growth, torn by storms of hail or wind, injured or killed by frost."

During the year ending September 30, 1837, tobacco to the value of five million seven hundred and ninety-five thousand six hundred and forty-seven dollars was exported from the United States to foreign countries.

II. THE HOP.

The Hop, *Humulus Lupulus*, is a native plant, and is found growing spontaneously on the banks and intervals of many of our large rivers. It has been cultivated for its flowers, which are used for giving a better flavour to beer, and also for preserving it, as well as for various other purposes, though the first mentioned is the principal one. It is a perennial rooted plant, with an annual twining stem, which, on poles or in hedges, will reach the height of from twelve to twenty-five feet. There are several varieties.

The hop is raised from slips taken from the stem, or from sets taken from the root. They are planted either in autumn or in spring, but the latter season is most generally preferred. The plant is in full bearing in its third year; and a plantation, if properly attended to, judiciously located, and on good soil, will yield profitable returns for twelve to eighteen years, when it must be renewed; the old plants being grubbed up and fresh sets planted. The slips or sets are obtained from the pruning of the old plantation, or from the roots. Each slip should contain two joints or buds. They are frequently planted in a garden for a season, before being set in a plantation.

Forming plantations of hops—preparation of the ground, culture, &c.—Col. SAMUEL PEABODY, of Amherst, New Hampshire, has been a successful cultivator of the hop for the last twenty years. He furnished by request the following account of his method of forming his plantation of hops, their culture, &c. &c.* It is the best account we have yet seen—fully sustaining that of Mr. BLANCHARD†—and coming from a practical and intelligent cultivator of twenty years successive experience in its culture, we think we cannot do our readers a greater service than by incorporating it in this work.

I cultivate the various farinaceous productions of New England, like most farmers. But hops constitute my principal crop. I have picked twenty successive crops of that vegetable. I here give a list of the quantity raised by me in the following years. In the year 1829, 800 pounds—1830, 3,400—1831, 4,565—1832, 6,400—1833, 11,560—1834, 11,000—1835, 5,297—1836, 13,540—1837, 11,100—1838, 7,824. Total, 75,486 pounds. In some years I have, averaging the whole, raised more than two pounds to the hill, but oftener less. The years 1835 and 1838 were very unfavourable, and the crops suffered much. This crop like others is variable. It is impossible to calculate with much accuracy beforehand the quantity to be raised from a given number of hills. But it may be done with more certainty, than upon corn or wheat. In 1838 the drought bore very hard and stinted the crop more than others.

The first thing to be attended to is *the poles.* The best species of trees are the cedar, spruce, hemlock and white pine—white birch and hard wood are sometimes used, when those named are scarce; but they are poor things. The poles should be cut in the winter, drawn home and shaved all over lightly, except near the top, and sharpened ready for use.

The soil for hops may be good, dark, deep, rich loam, or it may be light, sandy and poor. Like other crops, however, similarly situated, the crop of hops will accordingly be heavy or light. I have tried different kinds of soil, even to the extreme. Of late years, I have used good intervale, and my reward has corresponded. In short, good corn ground is good hop ground.

The preparation of the ground is no difficult matter. Prepare a piece well for Indian corn, and it is prepared for hops. Some people are very particular in lining out their rows of hops, while others strike out the ground with a horse and plough, judging of distances by the eye. In striking out my rows, I generally use a pole to be drawn by two men; to which pole is attached three or four draft chains, placed at half the distance of hop hills. Because every other row each way is to be planted the first year with the seed of some other crop, generally Indian corn. As hops become more or less troublesome by rising or growing up very inconveniently above the level of the field, I therefore, of late, take pains to sink my hills, where the ground is sufficiently dry to admit of it. This is done by men, who take each a sharp steel shovel, and at every cross of the chain where the hop is to be planted, spade down about the length of the blade, and take out the turf and soil, one and a half to two feet square, and lay it on one side. Into these holes I usually put two shovels full of old manure, or good compost. I will just observe, however, that before ploughing, I have of late spread a good coat of manure, which was of course turned under by the plough. Upon the top of this old manure in the hole and near the centre of the hill we drop three cuts of hop roots nine to twelve inches long, and then cover the depth of corn.

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* Farmer's Monthly Visiter, vol. i. page 34.
† Complete Farmer, page 150.

The roots for planting must be taken, as is well known among all hop growers, from what is called the sprout roots. These are entirely different from the ground roots. The latter, like roots of other plants, support the stalk, and, having no eyes, would not, if planted, produce a blade. Whereas the sprout roots appear to be arms, shooting out under ground, and if unmolested, would throw up tops from every pair of eyes at every distance of about six inches. These sprout roots are cut, as I have said, into lengths of about one foot for planting, allowing three pairs of eyes to a piece.

The distance between hills is important. On rich soil, well husbanded, they should be further apart than on that of poor or medium quality. At my last planting on a deep rich loam, I put the hills eight and a half feet apart by measure, and with which I am satisfied. On poor soil seven feet distance might do. If they be too near each other, there is too much shade, and the fruit is both small in quantity and poor in quality.

The poles should be of a proper length, twenty feet or more, on rich land—and on poor land shorter. If poles are too short, the bind or vine, after running to the top, doubles down, and running round, makes a great bushy head, or otherwise strikes off to the poles of the neighbouring hills. In the last case there may be ten or twenty hills with the vines completely interlocked, producing a very unpleasant effect. This is what the English call "*housing*," the connected tops bearing some resemblance to the roof of a house. The consequence is, that the fruit grows in the shade and single instead of in clusters, soft, green, feeble and deficient in strength. It also makes the picking slow and troublesome, and the labour of the box-tenders much more severe.

The opening and dressing of the hills is another important epoch of the season. I begin as soon as the frost is out of the ground by back furrowing lengthwise and crosswise with a strong team, usually two pair of oxen, and two bouts in a row. Then come the men with the prong hoes, throwing off the soil from the top and sides of the hill and hauling up the sprout roots, as they come to them, and opening the hill, as far down as they can, without injury to the ground roots. We take pains to make the hill soft and suitable to receive the rains.

The trimming is next in order. This operation is always performed with a knife, cutting the sprout roots two or three inches from the stump, taking care to amputate the old snout, i. e. the stump of the old vine down for two sets of eyes, and even more if it will admit. Cutting off the old snout should never be omitted, as vines from the eyes of it never prosper; and an additional reason is to keep the hill as low down as possible.

The manuring of a bearing field must be attended to. The manure is applied in various ways and at various times, according to the taste and judgment of the grower. Some manure in autumn, laying one or more shovels full on the top of the hill, without any covering. This is an old fashioned practice, and as I view it, a very indiscreet one. If the owner should not lose more than one half of his manure, he may consider himself well off. Another method is to spread the manure in the spring and plough it in. This plan I consider very judicious, if the planter have a good supply of the article; and in that case, no matter how strong the manure. One old way was to lay the manure on the top of the hill after trimming off the sprout roots in the spring, and then covering with soil. But this is bad. In the first place, the requisite quantity of soil to cover the manure to a proper depth makes the hill too high and troublesome. Another inconvenience is, that the young hop blades find it difficult to penetrate the covering, and many are compelled to find their way out of the sides. For the last eight or ten years, I have invariably laid my manure, generally two shovels full to the hill, (and I prefer old or good compost,) round the hill in the circle made by the hoes in opening. Thus applied, I consider it better for the hops, giving a better shaped hill also, better saved, as it is covered deeper, and better every way; in fact, the best way, except perhaps spreading. This being done, then cover the hill and the manure; the top of the hill two or three inches, and the sides will get covered necessarily double that thickness, as they should be.

Setting the poles is the most laborious part of the whole work. I always have my own poles laid out between two rows of hills, four together and the butts opposite the two hills in which they are to be placed, and so on through the field. The holing, (which is a previous step to setting the poles,) is done with iron bars. For a few years I have had my pole holes all made toward the diagonal corners of the hills, placing them as near together as circumstances will admit to keep the hill conveniently small, and leaning them, as all hop poles must lean, towards the hills *diagonally* opposite. For this method of setting poles there are strong reasons. First the space between rows is equidistant each way. But the principal reason is, that it gives more space between poles, so that the vines shall not reach across and interlock. When the rows are eight feet, the distance gained for the poles, compared with the old way, is about four feet.

Tying the vines to the poles is an indispensable part of the operation. It requires care not to injure the tender shoot. If injured, break it off and let the stump throw out another. The tying should be repeated as often as circumstances require. In Milford we continue to apply our strings as occasion may require, till the vines mount near to the top of the poles, using hop ladders. Old woollen stocking legs furnish the best tie yarn.

At the first hoeing the useless vines should all be killed. To prepare for hoeing, I always plough two bouts in a row each way, sometimes from and sometimes to the hill. I never plough from the hill more than once in a season. At the second or third hoeing, I frequently hoe from the hill, or rather down the hill. I settle the hoe into the ground to the depth of one and a half inches, and as near the pole and vine as safety to the latter will admit, drawing the hoe down to the furrow, and skimming off the top of the hill to that depth. This plan kills weeds equally well, lightens and opens the ground, and abates that nuisance to all hop growers, viz: an overgrown hop hill.

Hop yards are kept up so many seasons as to be much exposed to weeds. The most eminent grower in Massachusetts, now deceased, once informed me that his practice was to pasture his horse at times in his hop field to reduce the weeds. And I have repeatedly known the growers to go into their fields with scythes and shorten them in that way. Years since, when I was suffering with these difficulties and the weeds were carrying on open hostilities against me, and the question must be settled who should fall and who survive, I had the presumption to plough and hoe my hops as late as the middle of August. On the succeeding year there was scarcely a vestige of a weed. And I have repeated the practice as occasion required. On my first experiment, I did it with trepidation, as on examination, I found the ground near the surface exuberantly interlarded with capillary hop roots. The operation destroyed all my vegetable enemies for that and some succeeding years; and, as I judged, did the field as much good (and perhaps more) by getting rid of so many dependants and loosening the ground, as harm by destroying the capillary roots. At any rate, I had a noble crop that year. I do not recommend it for general and annual practice; but I do recommend it as indispensable, on certain occasions.

There is little more to be done to hops, at hay time, but occasionally to set up windfall poles. On the 25th of July you will find them in full blossom. Success in this crop depends more than any other, upon the care and skill of man.

Hops must be picked when they are ripe, and upon no consideration before that time. All other business must be made to accommodate itself to hop picking; as the whole labour upon them is lost or saved by timing this matter with much precision. I believe that there have been more hops damaged by the hand of man in picking too early, than all other ways put together. When hops are ripe, the seeds are black, the fruit (the calices) approach more or less to straw colour, and being rubbed in the hand, give out a strong and fragrant odour.

To settle the question of the time of picking may demand long experience: Let those who are inexperienced, guide by those whose hops are annually reputed the best. Fields differ, no doubt, somewhat as to the time of ripening. After twenty years of experience upon the subject, nine of which has included the duties of inspector, I believe that few hops are truly ripe and fit for picking before the 10th of September. I find a memorandum in my inspection book of 1833, in these words, "among the hops inspected this year, I find those picked from the 10th to 15th of September, to be best." There is one gentleman in Milford, who was for years distinguished above all others for the excellence of his hops. I remember that one year he did not begin his picking till the 14th or 15th day of September. When he ordinarily begins, I know not. Hops should not be picked when wet. Being picked with the dew on is some slight injury. I never suffer my hop pickers to go out till after breakfast.

Hops should be picked clean of stems and leaves. If any one thinks that those extra ingredients are of little consequence, let him pick them separately and make his own small beer and yeast from that stock, and send the clear, clean, dry picked, well dried, ripe fruit to those who are ready to pay cash and the highest price therefor. It is due to the market, and due to the inspector, to present your crop, of as good a quality as Providence has given, and without deterioration from the hand of man. Self interest ought to induce much care, as the article must pass the ordeal of inspection. But I think that inspectors, (some of them at least,) are not apt to exercise due vigilance with respect to dirty hops.

Bagging. After a very varied practice of transporting hops from the fields to the kilns, there is now a pretty well established custom of putting them into bags for that purpose. I have for some years practised this mode. My bags are six feet long, and so wide as to have them emptied from the box into the bags with bushel-baskets. This is a convenient size for a man to handle. The green hops should not be trod into the bags. It is almost impossible for me to enumerate all the ways of damaging this article. Green hops cannot lay long in boxes or thick piles, and especially in bags, without injury.

Hops should be laid light upon the kiln cloth. Mine are always handled over, after they are emptied, and laid as light as possible upon the kiln cloth. If they are allowed to lay as they are emptied, in a dense mass with no operation except that of levelling, they never dry even, and never dry well.

The process of drying is generally considered the most difficut part of hop business. There are various ways in which hops may be spoiled or damaged, after they are well grown, well picked and well laid upon the kiln. Three quarters of a pound when dry, to a square foot of kiln cloth, is enough. I should prefer one half a pound to a square foot. When thin, they come off brighter. They should be allowed to lay upon the kiln about or quite twenty-four hours. If moderation is expedient at any time it is in hop drying. The fire at first should be moderate, and after the hops are well warmed, it should be increased to a proper degree and kept as even as possible till the work is finished. If circumstances will admit, it is best to let them cool down upon the kiln before removing. In which case, they are not so dry and husky, and are less liable to lose a portion of that part, which solely constitutes their worth, viz: the *lupulin*, commonly called the flour. In shoving them off when dry, more or less of that flour shakes out and sifts through our thin, strainer-like kiln cloths, and is lost in the kiln below. There is one gentleman in Lyndeborough, who takes this precaution, after the hops are dry and before removing, to suspend a Burlap cloth beneath his kiln cloth, to save the flour. The Burlap is then removed, emptied, and the kiln prepared for fresh hops. His kilns are so constructed, as to be easily entered by a door. Hops are sometimes over dried, but oftener under dried. If scantily dry, they should not be laid promiscuously in large piles, but by themselves, and thin, and where they can have air. In such case, it may be necessary too to shovel them over. But after hops are once dry and laid away, I prefer not to be under the necessity of moving them until they are bagged, as I consider repeated exposure to air by shoveling over, of some injury to the colour and no doubt to the flavour. Dry hops should not be laid where they will feel the heat of the steam of the hot kilns.

If they feel the continued heat from the drying kilns, the drying process is still unnecessarily and injuriously continued, and they consequently lose a part of that excellent flavour and fragrance which constitutes the properties of first sort. They are also liable to become chaffy. If they lie within reach of the rising and drifting steam of the hot kilns, they will be coloured and injured by the steam settling down upon them.

After hops are dried and removed from the kilns, they should be allowed to remain in a cool place, neither too close nor too airy, for a week or fortnight, to go through with an after process, commonly called toughening. It is the same process through which hay and the straw of grain and all such products pass, after packing away. After hops are removed from the kiln and sufficiently dry for that purpose, there is still some moisture left in some of them, either in the core or the thick part of the leaves, which will escape by nature's law of evaporation, some of it lodging in the leaves, that are now dry, rendering the whole mass tough, and some portion escaping into the air.

After hops have laid long enough to be fit for bagging without risk, the sooner it is done in my opinion, the better; as they waste less in strength and flavour after they are screwed into bags, than they do when lying loose in bulk.

There are a number of varieties of the hop, Humulus Lupulus. Beside the male hop, I know of but three varieties, viz: the long whites, the French and the teasel. Mine are the long white, as are most of the hops raised in this vicinity. This is also esteemed the best, both as to its productiveness and the quality of the product.

In one respect hops are an exception to the farinaceous and most other kinds of agricultural crops, as neither by fermentation, distillation, or any other process, can they be made to produce an intoxicating liquor. They are a strong antiseptic, and are used to preserve yeast and beer of all kinds, and perhaps other materials. The quantity of hops raised in this country has varied from year to year, ranging from one million to three million pounds. An average crop in Great Britain is about forty-four million pounds. The amount of our crop for the last year or two has exceeded a million; and perhaps has come up to a million and a half. When the shippers find it a good article of export, our hop growers find themselves very liberally paid for their long course of care and labour in growing and curing the article.

The estimated number of inhabitants in the United States is fifteen millions. Allowing five individuals to a family, which was about the average in New England at the last census, the quantity of hops raised in the country would give about half a pound to a family through the nation. This is evidently a small supply, for yeast and small beer, to say nothing of the bakers, who are regular and free consumers of the article. However, much of it goes with a far greater quantity of barley to be consumed by the brewers of pale ale and porter.

To judge of the quality of hops, as the chief virtue resides in the yellow powder contained in them, which is termed the condition, and is of an unctuous and clammy nature, the more or less clammy the sample appears to be, the value will be increased or diminished in the opinion of the purchaser. To this may be added the colour, which is of very material consequence for the farmer to preserve as high as possible, since the purchaser will most generally insist much on this article; though, perhaps, the brightest coloured hops are not always the strongest flavoured. The hop is liable to many diseases, and the attack of numerous insects.

The following letter from Mr. Fidler to Judge Buel will be found both interesting and beneficial to the cultivator of the hop.

Albany, *August* 11, 1834.

Dear Sir—Agreeable to your request, I send you some account of the method of curing hops, as practised by the most successful persons I have known in that business, and also take the liberty of pointing out some of the common faults our western and eastern hop raisers fall into. There are so very few hops that are brought to our market of a prime quality, which makes it one of the most disagreeable tasks to select a supply, from the large quantities that are offered for sale; and it is truly lamentable to see the immense sacrifice of property from the want of care or skill in their management.

It may not be improper to premise, that hops, to be productive, require a rich soil, an airy situation, as well as an occasional manuring; even the best lands ought to have, every two or three years at farthest, from thirty to forty loads of well rotted barn-yard manure to the acre; and although the wild hop is generally found on the banks near water, yet hops thrive well on almost any good land if properly attended to.

The time of picking hops varies—light soils or elevated and dry situations are earliest; even in a yard of a few acres, situated on a side hill, the highest ground is often ready for picking some days before the lower; and sometimes from the poverty of the land, the middle, or it may be, the lower part is ripe first. In commencing picking, too much care cannot be taken in gathering those first that are *ripe*, and not in picking those that are *largest*, as is often the case. The time of picking may be known by their change of colour, from deep green to a light yellow tinge. If they have seeds, the hop ought to be gathered as soon as the seed turns brown; but the certain indication of picking time, to those who are familiar with this article, is when the *lupulin*, or small globules of the bright yellow resin, are completely formed in the head of the hop, at the bottom of the leaves, and the leaves are readily rubbed from the stem. The lupulin (or flower of the hop as it is commonly called) is the only valuable part, and if gathered too early, before it becomes perfect turpentine, it soon dissipates and loses its fine aromatic flavour and all its medicinal qualities. Hence, gathering hops too soon is a total loss, and instead of imparting a palatable pleasant flavour, and giving its fine tonic balsam to ale, they are unquestionably an injury, and ought not to be used; and if gathered too late, the lupulin drops out, and the hop is of no value; but the experienced cultivator takes the medium, commences when the hop is first ripe; has every thing prepared—his hands, kilns, baskets, baggings, &c. Five or six days ought to finish the whole process of picking and curing, if his yards ripen about the same time. The hop should be picked clean, without leaves or stems, and if possible without dew on them, nor *pressed too close*, nor put in *too large quantities*, before going on the kiln, or they will *heat*. No rule can be given for the thickness they ought to be spread on the kiln, or even for the length of time necessary to dry them. A skilful operator is the only safety in this process. Care ought to be taken that the kiln draws well, as much depends upon its draft—the steam should not be allowed to fall back on the hops, and must pass off freely.

Preparatory to putting the hops on the kiln, it must have a fire put in, made perfectly dry, and fumigated by burning brimstone to take away all the bad smell, and when perfectly sweet, a layer of hops put on, say eight or ten inches deep, and this may be increased or lessened as the operator finds the draft. The time used in drying will also depend on the quantity of hops on the kiln, and on the draft, say from eight to sixteen hours; but they must not be removed from the kiln until the core or stem of the hop is crisp and well dried, they must then be put upon a floor, and occasionally turned, until the leaf becomes tough, when they are ready for bagging.

The fuel used for drying, must be of the sweetest kind, and *perfectly charred*, and the best is beach, birch, hickory or maple. Pine may not be used under any circumstances, nor any brimstone, only as before directed. When the fire is once put to a kiln of hops, it must never be permitted to slacken or go out, until they are dried. The fire should never be so hot as to burn or leave the least taint of fire on them.

I would suggest to all our hop raisers a system to be *adopted and never deviated from*—that is to divide very carefully the hops into three equal parts or parcels, the first, second and last pickings. If six days are consumed in picking, let the hops of the two first days, the third and fourth days, and the two last days, be kept separate, bagged and marked; each parcel will by this method be more valuable to the brewers, and enhance the price of those that should thus be brought to market if skilfully picked and cured. It would also be a good regulation to have all our hop raisers put as near as may be two hundred and twenty pounds in each bag, and have all the bags of about one size, say five feet long, two feet wide, and eighteen inches thick—this would be more convenient for the brewer, but particularly so for shipping; and should we be so fortunate as to rescue our hops from their present degraded condition, they will soon be one of our principal articles of commerce. In a letter I received a few days since from a Havre merchant, he remarks, "the American hops are of all qualities, from the Vorgue refuse, to the delicious fragrant German; and if you could establish for yours the reputation of the latter, they would command the market." There is not perhaps amongst the whole range of resins, one so delicate, rich and powerful an aromatic as the hop, nor one more easily destroyed by improper treatment; nor is there another article of produce or manufacture so little understood and so unskilfully managed.

In connection with two of the largest brewers in the country, we purchased in the Boston market, last fall, a quantity of hops, and in the first shipment of about *two hundred bales*, there was not, after a careful examination, jointly, over *twenty-five bales* that ought to have been used, and all those were injured by being picked before they were ripe. This is not an individual instance; it is a prevailing evil, and of the total amount brought to Albany, speaking within bounds, more than one-half are destroyed or injured by early picking. This evil ought to be at once remedied; but let me caution your raisers not to run into the opposite extreme, and pick them as much too late.

For the last fifteen years, I do not recollect a season but repeated instances have come to my knowledge, where the farmer has totally lost his crop by having it heated from neglect in not drying them well on the kiln.

How truly mortifying, when the farmer presents his hops, the fruits of a season's anxiety and labour, to be told they are scarcely fit for manure. I do know some men, whom I esteem as men of sense in other matters, year after year bringing their damaged goods for sale, in every other respect a splendid article, and having them heated, and this, after each year's repeated advice and caution. Of the amount of loss from this source, it would be difficult to form an estimate; it is however large. There are more hops injured from partial drying, in seasons when the crops are abundant, than in ordinary years, by not having kiln room enough, hence they are hurried off undried; this evil is easily corrected by having always rather too much than too little kiln room; the additional expense is trifling.

The next serious injury from want of skill in curing, is that of scorching or burning the hops on the kiln. There are large quantities, every year, of western hops destroyed or partially injured in this way. Our eastern hop raisers are far before those of our state in curing them on the kiln. Scarcely an instance of scorching on the kiln, or heating after being bagged, is known amongst them, and the fault with us must be want of care or skill.

The hops of this state, as a whole, are not cleanly picked, and are often injured by having them heated before going to the kiln. Many have their kilns so low, that the steam does not go off, consequently the hop is stewed in its steam, and by this means materially injured. A common practice of using coal, partially charred, smokes the hops, and their rich flavour is materially injured, and often totally destroyed. That we may not forget, let us recapitulate our grievances: about one-half our hops are injured by picking before ripe, (our eastern hop raisers do more injury in this respect than our western farmers,) another part are injured by partial drying, and bagging them in that state; another part are scorched or burned; some are heated before going on the kiln; some stewed on the kiln; some smoked; some gathered with the leaves and vines; some send us brimstoned hops, and a few good fellows bring us as fine hops as any part of the world can boast of, and they ought all of them, or nearly so, to be of this fine quality.

Let our farmers make exertions to cure their hops as well as our eastern friends, and their hops will find the readiest market and the best price, and will, intrinsically, be near double the value of the eastern, or until the eastern raisers let their hops ripen before they are gathered. It may be justice to our friends of the east to state, that the fault of picking their hops too soon, (and this is their only fault,) has been the mistaken advice of the hop inspector, who has branded the ripe hops as *seconds*, and those which were *refuse*, from being picked too early, he has branded *firsts*. I have often, some years since, remonstrated with the inspector on the injustice of his branding the refuse as firsts, and the firsts as seconds. He admitted, in his opinion, the course he was pursuing was wrong, but some pale ale brewers had advised him to brand the pale hops as firsts, to encourage the picking early. These ill-omened men have done incalculable mischief, and an evil that will take years to repair. There are, and it is to be regretted, but few brewers who are good judges of hops. I have not, however, conversed with an individual, even of my own brethren of the pale ale stamp, who has not admitted the propriety of all I have advised. I must again repeat, that hops too early picked, are the worst refuse we get; they are totally destitute of the only valuable part, the resin or lupulin. The hop is gathered before it is formed, having only a sort of sap; not only the smell, but also every appearance of lupulin is soon dissipated.

In submitting these brief remarks for the consideration of those interested, it is with a sincere hope that all will unite cordially in endeavouring to place the reputation of hops of America as the best in the world.

I am, very respectfully, yours, &c.

L. FIDLER.

J. Buel, Esq.

There are many other plants cultivated for their bitter principle, and which are good substitutes for the hop; but they can never be cultivated to a profit on the farm.

XIII.—CULTURE OF PLANTS USED FOR FORAGE OR HERBAGE.

Plants cultivated for *forage*, says Low, are those which are known and used either in a green or dried state, as the food of animals. Plants cultivated for *herbage* are consumed upon the ground where they are produced. Certain kinds of plants are better suited for forage than herbage; but many are adapted to either purpose, and therefore no distinct line can be drawn between the two classes—consequently they are not treated separately in the following pages. The limits of our work will not allow us to go into a minute detail or description of the great variety of grasses known and treated of by botanists.* We shall confine ourselves mostly to such as are now cultivated among us—or are adapted to our climate, and may be introduced profitably into the system of American husbandry.

I. CLOVER.

The cultivation of clover and other herbage plants used exclusively as food for live stock, is comparatively a modern improvement. Clover at this period, enters largely into the succession of crops on all soils—and in every productive course of management. The characteristic points of culture of this class of plants, are broadcast sowing, mowing, soiling and hay-making; and that when cut for the two last purposes, two or more crops may be had in a season from the same roots. Few things have contributed more largely to the modern improvement of husbandry, than the introduction of clover, in connection with the rotation of crops. While it tends to meliorate and fertilize the soil, it at the same time affords an abundance of wholesome food for every description of farm stock. Few if any plants surpass it in the quantity of cattle food which it

* Sir John Sinclair says, that there are two hundred and fifteen different kinds of grasses, properly so called, which are known or cultivated in Great Britain. The duke of Bedford caused a series of experiments to be instituted, at a vast expense of money, to try the comparative merits and value of these grasses to the number of ninety-seven. According to these experiments, tall fescue grass, *festuca elatior*, stands highest as to the quantity of nutritive matter afforded by the whole crop, when cut at the time of flowering; and meadow cat's-tail grass, *phleum pratense*, called in New England herd's grass, and in the middle and southern states timothy grass, affords most food when cut at the time the seed is ripe. *Complete Farmer*, page 15.

affords. It was the making of the Low Countries, and although not introduced into England until the sixteenth century, it has converted some of its poorest districts into the most productive and profitable, and its effects in this country are certainly not less beneficial.

Judge Buel states, that "clover, in connection with gypsum, first became a subject of notice and culture in the counties about Philadelphia, and in Dutchess county, New York, about forty-five years ago." As yet, its value has not been duly appreciated by our American farmers, and consequently but little comparative benefit has been derived from it from what might be realized from its general introduction. In some sections—embracing entire counties—its worth is known and appreciated; in many such cases it has imparted a new aspect to the country, while it improved and enhanced the value of the land and the wealth of the cultivator. The late Judge Peters took an active part in introducing the clover culture to the attention of American husbandmen.

The species of clover in cultivation are—1. The RED CLOVER, *Trifólium praténse,* a biennial, and sometimes, especially on chalky soils, a triennial plant, known from the other species by its broad leaves, luxuriant growth, and reddish purple flowers. In its wild state a perennial. It is a native of Europe and America. 2. The *white, creeping or Dutch clover,* (*Trifolium ripens,*) a perennial plant, known by its creeping stems and white flowers, is hardy, and suited to a great variety of soil and climate. No plant known in the agriculture of Europe, is so generally capable of cultivation as the white clover. There are varieties of it, more or less nutritive and productive. It is usually mixed with one or more of the other grasses. 3. The *Trifolium incarnatum,* CRIMSON CLOVER, is a native of the southern and central parts of Europe. The colour of its flowers is a beautiful red, known and cultivated in some parts of the United States as *Italian clover.* Though an annual, it is found very advantageous on dry sandy soils. In the southern departments of France, where it is extensively cultivated, it grows during the winter, (which must be very mild,) and early in spring affords abundant food for sheep; or, if left for May, it presents a heavy crop for the scythe, and may be used for soiling or making into hay. It was introduced into England so late as the year 1824—is sown in March, and is in full bloom and fit for the scythe by June. Mr. Ellman says it should not be sown with grains like other clovers, because it grows so fast as to choke them.*

* Encyclopædia of Agriculture, p. 872.—Farmer's Journal, March 17, 1828.

The *soil* most suitable for the clover crop is a deep sandy loam, which is favourable to its long tap-roots, allowing them to penetrate freely; it will, however, grow on almost any soil, provided it be dry. The most suitable *climate* for the clover family, is one that is neither very hot, dry nor cold. The majority of leguminous plants delight both in a dry soil and climate, and warm temperature; and clover will be found to produce most seed under such circumstances. The production of seed is only in some situations an object of the farmer's attention. A season rather moist, provided it be warm, is always attended by the most bulky crops of clover herbage.

The *preparation of the soil and the manures*, which clover receives in the ordinary course of farm-culture, are those designed also for another crop. The Farmer's Assistant says, that the best crops with which to sow clover, are barley, oats, and spring (northern) wheat. But in this way it frequently happens, that the seeds do not germinate, in consequence of not being covered. This difficulty can be obviated by a light harrowing, which will also be a benefit to the young growth of wheat, rye, or oats. Unless, however, the soils on which these crops are sown are well pulverized, and have been some years under tillage, clovers will not succeed in them, it being ascertained that newly broken up lays or pasture grounds, cannot be sown down or restored to clovers and grasses till the soil is thoroughly comminuted, and the roots of the former grasses and herbage plants completely destroyed.*

Sowing. Clover is sown with other grain both in autumn as well as in spring. Some prepare the seed for sowing by steeping in water, and then mixing with powdered gypsum, as a preventive of the attacks of insects. The manner of sowing is generally broadcast. It is frequently sown in spring on the wheat crop sown in the preceding fall, and harrowed in. This process, although many plants are torn up and misplaced, instead of injuring, is of advantage to the growing crop of wheat. The depth at which the seed should be buried, depends upon the nature of the soil—half an inch may be reckoned the most advantageous position in a clay soil, and an inch in that which is light and friable. It is a very serious error, that small seeds should be sparingly covered. Misled by that error, many farmers cover their clover-seed with a bushy branch, which not only covers it unequally, but leaves a portion on the surface to wither in the air. Of clover, from ten to fourteen pounds, and of rye grass, about a bushel, are generally sown to the acre. Sown with barley, along with other seeds, in the

* Ag. Ency. p. 872.

following proportions—twelve pounds red clover, four white clover, two ribbon grass, and one bushel of rye grass.

The after culture of clover and rye grass, consists chiefly of picking off any stones or hard bodies which may appear on the surface in the spring succeeding that in which it was sown, and cutting out by the roots any thistles, docks, or other large grown weeds.* A top dressing of lime, plaster of paris, marl, ashes, &c., is found very beneficial. So congenial is calcareous matters to clovers, that the mere strewing of lime on some soils, will call into action clover-seeds, which it would appear have lain dormant for ages. At least this appears the most obvious way of accounting for the well known appearance of white clover in such cases. But this great wonder is thus satisfactorily disposed of by an intelligent writer in the Farmer's Cabinet.

There are few plants more widely dispersed over the surface of the earth than white clover; but where the soil is poor, or otherwise not well adapted to its growth, it is often so small, and grows so flat among the lower leaves of the herbage, that it is not perceptible unless a turf is cut and carefully examined by dividing it; hence, on breaking up and manuring such soils, or simply manuring by top-dressing, a spontaneous crop of white clover appears where it was never observed before, and without any supply of seed: this has led to strange conclusions respecting the propagation of this plant—many erroneously supposing that it originated from ashes or marl without the original intervention of seed. It has a perennial root, and the central root penetrates to a considerable depth in the soil, and the plant is thereby better prepared to resist the bad effect of severe dry weather, particularly on sandy soils.

The branches that trail on the surface send down fibrous roots from the joints which penetrate but a little way into the ground: hence it is, that the white clover maintains itself in soils of opposite natures; for if the surface be too dry to afford nourishment to the branches, the principal root preserves it; and when the tenacity and retentiveness of the soil in a wet winter is great enough to rot the tap-root, the fibres of the runners preserve the plant in safety. From this habit of growth, top-dressings and a frequent use of the roller encourage the growth of this plant in an extraordinary degree. When the soil is thin, or does not furnish food adapted to the nourishment of this universally dispersed plant, it seldom rises to a head, and the very small leaves lay close on the ground, so that its presence is not noticed, unless by a very minute and careful examination; but when proper nutriment is furnished, it springs up, flowers, and matures its seed so as to attract attention, and it excites surprise in the minds of those who were ignorant of the previous existence of the roots in the soil.—*Farmer's Cabinet*, vol. iii. p. 284.

The gathering of the clover and rye grass system is, either by cutting green for soiling, by making into hay, or by pasturing. The system of soiling will be described elsewhere. The general practice heretofore adopted and still practiced in the United States, of curing clover hay, is decidedly bad, inasmuch as it is injurious. The most approved method, and one to be generally recommended, is given in detail by Judge Buel, who urges it with confidence, being sustained by a personal

* Encyclopædia Agr., 8974.

practice of fifteen years. The reader will find it under the article "hay-making."

The saving of clover seed is frequently attended with considerable labour and difficulty. It is necessary to take off the first growth of clover either by feeding or with the scythe, and to depend for seeds upon those heads which are produced in the second crop in autumn. The growth reserved for seed, after the first cutting, which should, in this case, be done earlier than usual, must be suffered to remain until the husks become perfectly brown, when it is cut and harvested in the usual manner, leaving it on the field till it is very crisp, that the seeds may become more fully hardened. It may then be laid away dry, until required to be sent to the clover-mill. When a crop of clover-seed is to be raised, it should be from the last crop of the second year, as suffering the crop to ripen injures the roots for a succeeding crop.

The produce of clover hay on some of our best lands, has been set down at four tons—three tons is about the probable average yield of the country to the acre. The produce in *seed* varies from two and a half to six bushels per acre, when cleaned. But both depend, in a great measure, on soil, situation, and season. Dickson, in his "Practical Agriculture," says it bears hard on the fertility of the soil, to let the crop fully ripen; while others think it exhausts the soil but little.

All the varieties of clover are exposed to attacks from insects, and liable to various diseases—among them the blight or mildew. But the crop rarely suffers much from this source. A top dressing of lime and ashes is said to be fatal to the slugs.

II. LUCERN.

This plant, *Medicago sativa*, has been cultivated in Spain, Italy, the south of France, and on all the northern shores of the Mediterranean, time out of mind, as well as in the countries of the east. It was familiar to the Greeks and Romans, from whom we derive very minute accounts of its nature, properties and culture. Lucern is a deep rooting perennial plant, sending up numerous small and tall clover-like shoots, with blue or violet spikes of flowers. In Persia and in Lima it is grown extensively, and in both countries it is mowed all the year round. "Columella," a Roman writer, a few of whose works on agriculture have fortunately been preserved, "estimated lucern as the choicest of all fodder, because it lasted many years, and bore being cut down four, five or six times a year. It enriches," he says, "the land on which it grows—fattens the cattle fed with it—and is often a remedy for sick cattle."

The soil adapted to Lucern is deep and of the lighter class —with a free or kindly sub-soil. Unless the sub-soil be good and deep, it is in vain to attempt to cultivate lucern. That celebrated agriculturist, ARTHUR YOUNG, says that the best are all such as are at once dry and rich. Where these do not exist, it is better not to attempt its cultivation. Two methods of raising this plant have been recommended and practiced. 1. Sowing it broadcast in spring, sometimes along with a grain crop, and sometimes without a crop: the latter is the best practice, lucern not being suited to grow freely under the shade of other plants. 2. Cultivating it in rows, which is decidedly the best method. The rows need not be more than eighteen inches apart, which will give room for tilling the intervals with the cultivator. When sown broadcast, sixteen to eighteen pounds of seed are required; when sown in rows, ten pounds to the acre are sufficient. Care must be taken to keep down all weeds that spring up among the plants and in the rows.*

In the month of August of the first year when in flower, the crop may be mown, and, after the first cutting, the shoots may be kept down by a slight pasturing with sheep—but not while the soil is wet—nor continued until a late period. Early in the following spring the ground is to be horse or hand-hoed, in order that all weeds may be removed, and the earth stirred about the roots of the plants. In the month of May the crop will be ready for the first cutting. After being cut the cultivator is to be freely used in the intervals. It will now grow with great rapidity, and, when ready for cutting, is to be cut again, and, after each cutting, hand-hoed. In this manner it may be mown four or five times in the season. It does not however arrive at its full growth; after which it will yield a large return in rich and early foliage. But it requires to be manured at intervals of every fourth or fifth year. The manure may be farm-yard dung, spread upon the surface after the last cutting in autumn, or early in the spring.†

The difference in the method of tillage, when the system of broadcast sowing is adopted, is, that in place of the cultivator and hand-hoe, the common harrow is used, which, passing over the surface, stirs the soil about the roots of the plants, and drags up and destroys the weeds; the plant itself is benefited by this rough treatment.

* Professor Low. † Ibid.

The uses of lucern are various and important. The plant is eminently wholesome and nutritive. It is well suited for milch cows, causing them to yield good and abundant milk. It is admirably adapted to the feeding of horses; and it is used with great advantage for the soiling of all kinds of stock. Care is necessary not to give animals too much at a time, especially when it is moist, as they may be hoven or blown with it, in the same way as with clover, and other green food of luxuriant growth.

The produce of lucern cut four times in the season, varies from five to eight tons to the acre.—LOUDON. The probable average, all things favourable, may be set down at seven tons. But well authenticated instances are on record of immensely large crops having been raised.*

To save the seed, lucern may be treated precisely as the red clover. It is contained in small pods, and more easily separated than the clover seed. The *diseases* and *enemies* of lucern appear also to be the same as those of clover.

The following system has been adopted for a few years back by the farmers in the state of New York, and many of the eastern states.

"No crop gives so great a product of forage during the summer, and all domestic animals are fond of and thrive upon it. It is in condition to cut from the 15th to 20th of May, and will give three or four cuttings in a season. An acre of good lucern will keep six cows well from the first cutting; and as soon as the whole has been cut over to supply this number with food, the earliest mown will be fit to cut a second time. I have cultivated lucern ten or a dozen years, and it has been almost my whole dependence for the summer support of my cows and a yoke of oxen. An acre has been worth to me fifty dollars a year. But to insure a profitable crop, certain requisites are necessary, some of which I will name.

"Lucern must be sown on a dry soil. The roots penetrate four to six feet, and these will neither grow nor live where there is water. Sand, gravel, or loam are the best soils for it.

"It should be sown on a rich and clean soil. Without the first, the crop will be diminutive; and if weeds abound, they will rob and choke the young lucern, which is feeble during its early growth. The best preparation for it is a crop of potatoes, well manured and well cleaned in tilling.

"Sow sixteen pounds to the acre broadcast, with half a bushel of winter rye, early in May, in ground well pulverized, harrow

* See an interesting paper on the Cultivation of Lucern, by JAMES PEDDER, in Farmer's Cabinet, vol. iii. page 292.

in the seed, and follow with the roller. Or the seed may be put in with a drill-barrow at twelve to eighteen inches between the drills, at the rate of ten pounds the acre, and in this case the intervals should be kept clean with the hoe or otherwise. The duration of lucern is six to ten years; though it sometimes, like clover, suffers from the winter. The seed may be had at the seed shops in our cities at twenty-five to thirty cents per pound.

"To make lucern into hay, it should lie in the swath to wilt, and then be put into small grass-cocks with a fork (not rolled) to cure. After standing a day or two, the cocks may be opened two or three hours under a bright sun, the hay turned, and soon after housed. If spread like ordinary grass, the leaves dry and crumble ere the haulm or stalks are cured, and thus the best part of the fodder is lost. I have mixed lucern, partially cured, in alternate strata with dry barley straw on the mow, and found that cattle greedily consumed both in winter, when fed out in the yard."

III. SAINTFOIN—OR SAINFOIN.

Saintfoin, *Onobrychis sativa,* although not much known to our agriculture, is noticed in this place, because it is a plant which, in many parts of our country, may be very profitably cultivated; for although this species has an extensive range of the lighter class of soils, it is yet in a peculiar degree adapted to the calcareous. The French, to whom we owe our first knowledge of this plant, call it Sainfoin—*sain,* in their language, signifying wholesome—and *foin,* hay, in consequence of its agreeing so exceedingly well with all kinds of stock. The Complete Farmer, page 20, says that its cultivation may be considered as out of the question in New England, as so large a portion of it is winter-killed—this is the only objection that has been urged against its culture in the eastern and northern states. But this does not affect it in other parts. Every farmer, without risk, can try the experiment of its cultivation.

Saintfoin is a perennial deep-rooted plant, with a branching stem, bearing spikes of beautiful flowers. It grows wonderfully on rocky soils, stretching its roots to a prodigious depth among the crevices and open strata. It is in truth on dry rocky soils that the chief advantages of the cultivation of this plant are seen. On a chalky rock, covered with only a few inches of soil, it will thrive and grow for many years with vigour, where neither grain nor the cultivated herbage plants would cover the surface.

It may be sown with a grain crop in the same manner as the clovers and grasses. In the following season it may be mown for hay or green forage, although it does not obtain its full maturity until the third year. When this mode of sowing with a grain crop is adopted, the saintfoin should be mixed with one or more of the clovers, of which the most suitable is the white clover. A quart or two of the clover to the acre will be sufficient. It may also be cultivated in rows, like lucern—tilled every summer by the cultivator, and manured at intervals of four or five years. But the easier and more convenient practice of broadcast is preferred by the European cultivators. The quantity of seed to the acre when sown broadcast is four bushels; in rows, from two to three bushels. When sown in spring, the earlier it is put in the soil the better.

The *after culture* and management of saintfoin, consists in occasional dressings with manure, and in the judicious intervention of mowing and pasturing. In *gathering and using the crop* the same practices may be followed as in the taking of clover. It may be mown for either soiling, hay, or seed; and consumed on the spot by tethering, hurdling, or common pasturing. It does not bear as *frequent cutting* as lucern. It may be cut twice in the season for soiling; for hay, one cutting, and the aftermath depastured. When *made into hay*, it should be cut just when it comes into flower. It is rarely injured by heating, and may therefore be housed more quickly than other hay plants. The process of curing saintfoin is the same as that of the clover. See page 214.

The *produce per acre* varies according to the quality of the soil; from one to two tons will be about the proper average, considering that it is grown on inferior soils, and that it yields good aftermath; it will be found to be a very productive plant. The produce per acre in *seed*, is subject to great variations, from the changes of season and other causes. The *diseases* of saintfoin are few, there being, according to Loudon, little danger of failure after it has escaped the fly, which attacks the clover-seed in germinating.

Saving of the seed should be attended to. The husks are to remain in the field until they assume a brownish colour, and the seeds are perfectly firm and plump. Experience or great observation is necessary, to know at what period to cut for seed, as the seeds do not ripen at the same time. Some ears blossom before others: they begin to blossom at the lower part, and continue to blow gradually upwards for many days, in consequence of which, before the flower is off at the top, the seeds at the bottom are nearly matured; therefore, if the cutting be deferred until the top seeds are quite ripe, the lower, which are the best, would be shed and lost. The cultivator should bear in mind that the best time to cut is when the greater part of the seed is well filled, the first blown ripe, and the last blown beginning to be full. The unripe seeds will ripen after cutting, and be found in all respects as good as those that ripened fully before being cut.

John Hare Powell, Esq., who has done much to advance the character and interests of American husbandry, says, "saintfoin has been neglected, most probably, in consequence of the failures proceeding from the age of the seeds; they seldom vegetate when more than one year old, and hence fail when they have reached us in the common course with dealers' supplies. It should be sown as early as practicable in the spring, with half the usual quantity of barley or oats. The quality of the seed may be known by the brightness of the capsules, the fulness of the kernels, and by their colour, which should be blue-grey or yellow-red. As the seeds are large, and enveloped in thick capsules, they must be covered at greater depth, and with more than usual care. The roller should be applied if the soil and weather be in proper state." Soaking the seed for some hours before sowing, and then rolling in plaster, would, no doubt, prove beneficial, and obviate the necessity of unusually deep sowing.

Among the inferior herbage plants which are occasionally cultivated in England, and sometimes with us, by way of experiment, are burnet, ribwort, furze and spurry. Those which might be cultivated are very numerous, and include several species.* Very few are worthy the attention of the professional farmer.

Burnet, *Pimprenelle grande*, Fr.—*Poterium sanguisorba*, L. Those who wish to cultivate *burnet,* as an herbage or hay-plant, may treat it exactly as directed for saintfoin. As a pasture-plant it is sown among the grasses in the same way as white or yellow clover. A bushel of seed is commonly sown to the acre. It is of the rose family, and grows naturally on dry and calcareous soils.

Rib-grass, or Ribwort plantain, *Plantain des Prés*, Fr.—*Plantago lanceolata,* is a hardy plant, with a tuft of long ribbed leaves springing from the crown of the root, long, naked flower-stems, and a long tap-root. Arthur Young recommends this plant for laying land to grass, and has sown it on his own farm. The *culture* is the same as that of clover.

* Encyclopædia of Agriculture.

Its seed is about the same size, and consequently the same proportion will sow an acre. On rich sands and loams, it produced considerable herbage. On poorer and dryer soils, it is said to answer well for sheep, though its advocates admit that it is inferior to some others.* According to Mr. Marshall, it is in high estimation in Yorkshire, after having stood the test of twenty years' established practice. Linnæus remarks, that "it is eaten by sheep, horses and goats, and *wholly refused by cows:* yet we find the late eminent Baron Haller, attributing the astonishing richness of the milk in the celebrated dairies of the Alps to *this* plant, and the common lady mantle, (*Alchemilla vulgaris.*) Dr. Withering says cattle will not touch it when growing apart from other plants. It is not, therefore, surprising, that it has of late years fallen into disrepute. It produces an abundance of seed.

Spurry, *Spergula arvensis.* This plant is cultivated in some countries for herbage. It is of the pink tribe of plants, and is a native of the old and new continents, growing about Quebec and the river Columbia, and plentifully in the gardens and fields throughout Europe. It is valued for its rapid growth: sown on the stubble in autumn, it will produce a crop in the same season. It is, however, regarded as a weed, and valueless, and of course without a place in our system of agriculture.

Whin, Furze or Gorse. This is a shrubby plant, of which the soft shoots are cropped by animals; but it does not form the subject of cultivation in this country. It requires dry loamy land, well prepared, and like clover is sown in the spring, with wheat, barley or oats, at the rate of thirty pounds to the acre, harrowed and rolled in. Let them grow for two years, and then cut them by means of a hedge-bill.

Common Broom, *Genêt commun,* cultivated in the southern parts of France, in the same manner as hemp is cultivated. It does well on the poorer soils. It is sometimes raised for the feeding of sheep, but more frequently for the purpose of stripping the bark from it, and converting it into a kind of thread. It has little or no pretensions to the character of an herbage plant.

The Parsley, *Persil commun,* a well known biennial plant, with a large sweet tap-root, is a native of Sicily, but endures the severity of more northern latitudes like a native plant. It is cultivated in all our gardens. Its chief virtue consists in preventing the rot in sheep, for which purpose it is frequently sown along with clover and grass seeds. Mr.

* Complete Grazier, p. 498, 6th ed.

Fleet, an English farmer, says that he cultivates it largely with success. He sows half a bushel to the acre, with a bushel of rye grass, with spring grain, and he finds that it lasts in the ground until it is permitted to seed. He feeds it constantly—it being excellent for sheep—and, when suffered to get ahead, wonderfully fed upon by pigs in the autumn. The seed must be fresh, not more than two years standing. It requires a longer period to germinate than the seed of any other agricultural plant.

GRASSES.

The most important of the herbage plants of all countries, are the grasses, which are found clothing the surface of the earth in every zone, "attaining generally a greater height, with less closeness at the root in the warm climates, and producing a low, close, thick, dark green nutritive herbage in the cooler latitudes." Many of the grasses, however, are of low nutritive and productive powers, and in cultivated grounds are held to be weeds; but some of the less valuable require attention on account of their frequent occurrence, and their peculiar adaptation to soils low in the scale of fertility.

With respect to the general culture of grasses, though no department of agriculture is more simple in its execution, yet from their nature considerable judgment is required in the design. The creeping-rooted grasses will grow readily on moist soils; but the fibrous rooted species, and especially the more delicate upland grasses, require particular attention as to the soil in which they are sown; for in many soils they will either not come up at all, or die away in a few years. Hence, in sowing down lands to permanent pasture, it is a good method to make choice of those grasses which thrive best in adjoining and similarly circumstanced pastures, for a part of the seed, and to mix with these what are considered the very best kinds.—*Loudon*, p. 887.

A very judicious writer remarks, that it is a bad system to mix seeds of different plants before sowing them, in order to have fewer casts. It is better to sow each sort separately, as the trouble of going several times over the ground is nothing compared to the benefit of having each sort equally distributed. Grass-seeds cannot well be sown too plentifully, and no ecomomy less deserving the name can possibly exist, than the being sparing of grass seeds. The seeds of grain may easily be sown too thickly, but with respect to those of grass, it is scarcely capable of occurring. The smaller the stem, the more acceptable it is to cattle; and when the seeds of some grasses are thinly scattered, their stems tend, as it is called, to wood, and the crop is liable to be infested with weeds. Some think that if ground is well manured, good grasses will come in of themselves. Perhaps so; but how long will it be before that happens?

Clean seed, and that which is known to be suitable to the soil, should always be sown. For though grasses will gradually come in, no great crop is to be expected the first year, unless it be a crop of rank and useless weeds. And he that misses the first year's crop, loses much, as the longer the land lies, the more compact or bound it will become, and produce the smaller crops. Every farmer should carefully examine his fields that are coming into grass for next summer's mowing, and carefully note all the bald spots, where, by the lodging of grain or from any other cause, the grass roots have either not taken or been destroyed. On all such spots grass-seeds should be applied at as early a period in the spring as possible. Failures of this sort generally are found where the soil is strongest, and if grass-seed is not resown, there will be an abundant supply of weeds to annoy the careless farmer.—*Farmer's Cabinet*, vol. iii. p. 153.

New and excellent varieties of many of the grasses, especially those used or fit to be used in the convertible husbandry, might, no doubt, be obtained by selection and cross-breeding, and it is much to be wished that this were attempted by cultivators.

1. *Sweet Scented Vernal Grass.*

This is one of the earliest grasses of the spring, coming into flower about the middle of April, and ripening its seeds by the middle of June. It contributes mainly to give that delightful fragrance to new mown hay, so familiar to us. It grows on almost every soil. It is not of itself remarkable for its nutritive qualities, nor is it grateful to cattle; although eaten by them along with other herbage. Its value is chiefly derived from its early growth, its hardiness, and its continuing very late in autumn to show forth its flowering stems. We entertain the opinion expressed by a writer in the American Farmer, that it can scarcely form the subject, in any case, of useful cultivation. Introduced from Europe and extensively naturalized, being the only species of the genus which has found its way to the United States.*

2. *Meadow Foxtail.*

This is a very generally diffused species, of early growth; hardy, herbage nutritive, and apparently grateful to ruminating animals; sheep and horses have a greater relish for it however than oxen. It is perennial, and in England constitutes a considerable part of their richest meadows, and is one of the six kinds of the best British grasses for either dry or watered meadows. When the soil is neither very moist nor very dry, but in good heart, this grass is found to be very productive, continuing till late in autumn to throw forth its flowering stems. LINNÆUS recommends it as a suitable grass for grounds which have been drained; and Mr. CURTIS states, that it may be mowed three times in a year.

* Flora Cestrica, by Dr. W. DARLINGTON, page 64.

3. *Orchard Grass or Rough Cock's-foot.*

This is a native plant, coarse, but very nutritive, of early and rapid growth. In England, where it was introduced from Virginia in the year 1780, it is generally sown with clovers. It is justly held to be one of the superior pasture grasses, and is suited for forage as well as for herbage. It requires to be closely cropped. It grows well on loamy and sandy soils, and is not much injured in its growth by shade. LORAINE says, "it is very valuable. When cut by the scythe it neither waits for fresh shoots from its roots, nor until its wounds be healed, but continues growing on just as if nothing had happened. The leaves which have been cut, will grow on a rich soil, nearly, if not quite, one inch in twenty-four hours, forming new points gradually as they increase in length."

This (orchard) grass is worthy of being cultivated on account of its uncommon luxuriance. Horses, cows, and sheep eat it readily, and it is valuable on account of its excellent after-feed. 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 is a hardy grass, found highly useful in moist loamy soils, and thriving under the shade of trees. It comes early, is soon mature, and continues green until late in the season, as clover does. If intended for fodder, it should be cut while young and tender.

The quantity of seed to the acre is usually one bushel. JOHN HARE POWELL, Esq., who was many years since a successful cultivator, recommends two bushels to the acre. LLOYD JONES, Esq., in a communication read before the "Pennsylvania Agricultural Society," states, that he has cultivated orchard grass for twenty-five years, and he considers it as the best herbage for pasturage upon *upland*—for hay it certainly cannot be excelled. When his crops failed, it was owing to the bad quality of the seed; of this there can be no doubt, as he never lost a crop after he raised and secured his own seed. His method of saving the seed is this:

When in a state in which they can be shaken from the heads, the stems are cut by a skilful cradler just above the tops of the under grass. After some practice, he is enabled to catch with the left hand, the portion taken with the cradle, and to place them regularly as he advances. They are immediately bound in sheaves about as large as a man's leg. Double swarths are afterwards mown with a naked scythe to remove the under grass, and leave, at proper distances throughout the field, openings upon which the sheaves are shocked; in which state they remain from eight to ten days, until sufficiently dry to be carried to the barn, where they are forthwith threshed to guard against heating, the great source of injury to this valuable crop. The usual manner of securing them by putting the sheaves into the mow, is, I am satisfied, the most effectual mode to destroy the principle of vegetation, as they can rarely be so treated without being mow-burned. After having been threshed, they should be strewed upon the barn floor—occasionally stirred if the quantity be large, during eight or ten days, until they are perfectly dry—without this precaution they would inevitably be heated.

The under grass should all be mown for hay as soon as possible, after the seeds have been harvested. If it be allowed to stand but a few days, it loses its nutritive properties—in fact dies, after having lost the heads. The hay thus made, and properly secured, although necessarily harsh from having been allowed to pass the stage of its growth when most succulent and nutritious, I have found good fodder for both horses and neat cattle.

The product of seeds varies from ten to twenty bushels per acre. I have had in a very favourable season twenty bushels upon land which would not have afforded, I think, ten of wheat. The product of this, as of all crops, depends much, of course, upon the season and the preparation of the land. The crop to which I advert was purposely grown upon a poor soil, to show the excellence of the plant, and the fallacy of the assertion, that it required very rich land.

I sow from eight to ten quarts of clover seeds, and a bushel of orchard grass seeds per acre in February, upon wheat or rye land. I should prefer their being sown with oats or barley, as the seeds could be covered more regularly with the harrow, and their vegetation would be secured. I do not apprehend injury from frost in early sowing, but I dread the effects of drought from late. I have never suffered from early, but have generally had cause to regret the evils of late sowing.

4. *Timothy.*

Timothy is a well known favourite and native grass of the middle and northern states; it also flourishes well in the Carolinas, whence it was introduced into England by Timothy Hudson, about the year 1780. It is known in English practice as the *meadow cat's-tail* or *timothy grass*. In New England it is called *herd's grass;* while in other sections of the United States it is known as the *herd's of the north*, or *red-top timothy.**† It succeeds best in strong and moist soils, and does well in low grounds, greatly improving moist meadows overgrown with moss. On moist and rich soils it is very prolific. There is none of the grasses more easily cultivated, and what is of great importance is, that when cut in the seed it affords more than double what it does when cut in the flower. Of its very superior value, no doubt is entertained.

The *best way of sowing* it on low moist grounds, is immediately after they have been cleared and drained; on uplands, it is best sown with red clover, as the mixture not only makes hay of an improved kind, but the timothy, from its long, firm, upright stalk, will support the clover should it be inclined to fall or lodge. It is not to be mixed with clover in laying down meadows. The "Farmer's Assistant" says, that it fails in rich

* Dr. Darlington, in his "Flora Cestrica," says, "this grass in a *native of Europe*, but extensively naturalized in this country—generally cultivated in Chester county—and is undoubtedly one of the most valuable grasses known to our farmers. Mixed with red clover, it makes the best quality of hay. It requires a good soil, and is considered as an exhausting crop. The seed is usually sown in autumn, among, and immediately after, wheat and rye. It succeeds well when sown in spring."

† Professor Low and Mr. Loudon, both state that it is a native of Britain, *but* that it was first introduced into notice from Carolina, and we believe that Judge Buel in his tables claims it as a native plant.

arable soils in consequence of the sward becoming bound and thickened with other grasses; that, if not too closely pastured in the fall, harrowed every spring, and stock not permitted to enter upon it for a suitable time, it will last many years; and that in the rich and kindly soils, unless destroyed by close pasturing, it will last beyond the memory of man.

The produce on good soils, when not pastured, is four tons to the acre—frequently more, at two cuttings. When not pastured it yields nearly double the quantity of hay. The produce per acre in seed varies greatly—from ten to thirty-four bushels; the saving of the seed does not essentially diminish the yield of hay, and as it is easily gathered, separated and prepared for market, is a matter of considerable importance to the farmer, especially as the seed has always a ready market, and produces a fair price. Timothy should not be cut until it is in blossom, or a little later.

5. *Tall (Meadow) Oat Grass.*

Tall meadow oat grass, sometimes called the "*Egyptian oat*," and the "*Peruvian grass*," vegetates with uncommon luxuriance; flowers in England in June and July, and though coarse, is very profitable when closely fed down. It makes but an indifferent hay, but what is of great importance to the American farmer is, that it produces a very plentiful aftermath. It is the *Wiesenhafer franzosisch ray-grass* of the Germans. Mr. Swayne asserts that it yields a greater weight than any other description of grass; but according to Sir H. Davy, although very productive, it is disliked by cattle, especially by horses; which, he says, perfectly agrees with the small portion of nutritive matter it contains. John Taylor, Esq., of Caroline, President of the Agricultural Society of Virginia, and Dr. H. Muhlenburgh, of Lancaster, Penn., speak of this grass in the highest terms of commendation, recommending it with great earnestness to the attention of the American farmer. The last named gentleman says:

> I have cultivated this grass for a number of years, and find it, after a great many trials of pretty near all other grasses, the *earliest*, *latest* and *best* grass for green fodder and hay. It blossoms in the middle of May, the same time with the common red clover, and the seed ripens a month later. Horses, it is true, do not like it green, at least not all of them, but eat it in hay. Horned cattle prefer it to all other grasses. It will grow best in clover soil, and the leaves are from two to four feet high before it blossoms. In the blossom the stalk rises from five to seven feet. It ought to be cut in blossom about the end of May, [from the middle of June to the 5th of July in New York and the eastern states,] and will yield an abundance of sweet good hay. The seed may be sown in the fall or spring, with or without grain, and must be brushed in or

lightly harrowed. If mixed with clover it will make uncommon good upland meadow.

6. *Yellow Oat Grass.*

The yellow oat grass, *Avena flavescens*, thrives in meadows and pastures, and on hills, in calcareous soils, where it flowers in June or July. Though sweet, it is an inferior grass. The late Dr. WITHERING has asserted that it is less relished by cattle than the *poa* and *fescue* grasses; though Mr. SWAYNE thinks it one of the best grasses for cattle.* Mr. CURTIS says it promises to make good sheep pastures.† Sir HUMPHREY DAVY confirms this opinion, and says that it nearly doubles the quantity of its produce by the application of calcareous manure.

7. *Rye Grass.*

The Perennial darnel, or rye grass, is regarded in the north of England, and in Scotland, as one of the most important of the gramineous herbage plants. According to Low, it is more generally cultivated in Europe than either of the other herbage plants. This is owing to its early maturity, its wide range of temperature and soils, and to the abundance and facility with which it is raised from the seed. However valuable the rye grass from these qualities, it wants certain properties which others of the grasses possess, and a good permanent meadow, therefore, will best be procured by imitating the natural process of mixing grasses together. In this manner, the different kinds coming into flower at different periods of the year, will better afford a succession of herbage throughout the season. There are many more great advantages arising from a judicious mixture of grass seeds, and sowing the same bountifully, which will be noticed hereafter.

The characters of this plant are greatly modified by the effects of climate, soil and culture; and it may be owing to one, or perhaps to all these circumstances combined, with a slight admixture of *prejudice*, that it has fallen into disrepute among our farmers. This grass has been too much neglected, and we entertain no doubt, that with proper attention, it may be made to enter far more prominently into our system of agriculture than it has heretofore, and with decided profit. Perhaps one reason why it has been almost wholly neglected is, that it has lacked the sanction of great names. This is wrong. Every

* Gramina Pascua. † Curtis on Grasses, p. 18.

farmer should, in the first place, understand perfectly the nature and properties of the soil he cultivates, the crops best adapted to that soil, which is easily determined; and then, by adopting a judicious rotation, cultivate such as may be most advantageous.

There are two kinds of rye grass, however, which must be distinguished from each other in practice. The one flowers for successive years, and is therefore termed *perennial*—the other flowers in the second year, and having borne its flowers, the root decays. This is, therefore, a *biennial* plant, but it is generally termed annual rye grass. It is more productive than the perennial kind in the season after being sown; and hence, when the object is to retain the land only one year for a crop of herbage or forage, the shorter-lived variety is to be preferred. There are no means of distinguishing the two kinds from their seeds alone, and great losses have been frequently sustained by mistaking the one for the other, when the purpose has been to keep the land for several years in grass. When the land is to remain more than one year in grass, the perennial kind must be sown. In England, rye grass is always sowed with the clovers. Mixed with red clover it is well suited for hay.

G. Sinclair, of Woburn, who prepared the Table of Grasses experimented on under the direction and at the expense of that noble patron of agricultural improvement, the Duke of Bedford, says that the circumstance of its producing abundance of seed, which is easily collected—that it vegetates freely on any soil—its early perfection and abundant herbage the first year, which is much relished by cattle, are the merits which have upheld it to the present day, and will for some time to come continue it a favourite grass among farmers. In his second edition of his *Hort. Gram. Wob.*, p. 215, he remarks, that several new varieties of this species of grass, which have been discovered of late years, remove, in a very considerable degree, the serious objections applied to the common rye grass. They are as follows:—*Slender rye grass*, common in dry impoverished pasture land. *Compound or broad-spiked rye grass*, found in rich soils; a long under grass. *Pacey's rye grass*, found in rich meadow lands, by a gentleman named Pacey. *Witworth's rye grass*, introduced by G. Witworth, Esq., an eminent cultivator of pasture grasses, who in 1825, had sixty varieties of grasses under experiment, at his place in Lincolnshire, (Eng.) *Stickney's rye grass*, introduced by a Mr. Stickney. *Russell's rye grass*, first cultivated by the editor of the Farmer's Journal. *Church bennet*, or church bent grass, an excellent variety of the rye grass. All save the first two are excellent varieties. Pacey's and Russell's are said to be the best.

It prefers a rich loamy *soil*, but will grow in almost any kind except rock or undecayed bog. When *cultivated for seed*, it should not be mixed with clover, but may be sown with grain crops, and the year after treated like grain in every respect, bound up in sheaves, stacked, threshed with the flail, and dressed by the winnowing machine in the same manner. To obtain good seed, it must remain uncut beyond the proper season, to give the seeds an opportunity of becoming perfectly ripe, by which means the value of the grass for hay is greatly diminished.

This foreign grass is found in several neighbourhoods; is not extensively diffused, and I believe has not been cultivated here, though somewhat prized in Europe. It affords a tolerably good pasture, and makes a handsome sward for yards and lawns; but it is doubtless inferior in value, both to timothy and orchard grass. One other species has been naturalized in some parts of the United States.—*Dr. Darlington's Flora Cestrica of Chester county, Pa.*

8. *Italian Rye Grass.*

The Italian rye grass, *Solium italicum*, *Trifolium incarnatum*, is cultivated in Italy, France, and other parts of Europe. It reproduces itself freely from its seeds, which are scattered, generally, immediately on their becoming ripe;

grows with greater luxuriance than the common rye grass, and its nutritive properties may be inferred from the eagerness with which it is eaten by animals. It is probably in most cases of biennial duration; but by being cropped or mown, before flowering, it may remain several years in the ground. It appears to be a very valuable herbage plant; but farther experiments are yet required in the United States, to show how far its permanence in the ground can be depended on.

In a late number of the British Farmer's Magazine, the editor says:—The trial of this article for four seasons proves it far superior to every other grass for winter herbage, and much the earliest for feed of any grass in the spring; but what renders it still more valuable as a feeding grass is, that it is preferred by cattle to any of the common sorts—a fact which has been proved by numerous experiments in various parts of the country; and the rapidity with which it again shoots forth after having been either mown or fed off, renders it particularly advantageous for light soils, as the common rye grass never sends forth a second crop, either for feed or seed, of any consequence. In poor land it may be safely sown with clover (as it has been with success in France) to the great increase of the crop and benefit of the quality of the hay. These results fully show it to be well deserving the attention of agriculturists, possessing as it does, greater hardness, and uniting in itself all the good qualities sought for in rye grass.

It is a subject of astonishment that this valuable plant, (*Trifolium incarnatum*) should not have been long ago introduced into this country, and cultivated on an extensive scale. If sown in autumn, after a crop of potatoes or other roots, it produces next spring a crop fit to be cut for soiling cattle, eight days earlier than lucern, and a fortnight before red clover. Care, however, must be taken to have good seed, and not to sow it too deep. It produces two excellent crops in one year, the first of which should be cut as soon as it comes into flower, and the second will produce a considerable quantity of seed. From its early growth in spring, when other articles for feeding stock with advantage are so difficult to be obtained, it is likely to become a valuable acquisition to British husbandry.—*Sir John Sinclair's Code of Agriculture.*

9. *Fiorin or Bent Grass.*

The *fiorin or bent grass*, sometimes called *creeping bent grass*, affords a wholesome food to cattle—is a very common grass in England, and many parts of Europe. It flourishes astonishingly in Ireland. It will grow both in wet and dry, rich and poor situations, frequently vegetating with such luxuriance, as to suppress the growth of moss and other weeds. On rich marl soils, and in moist soils, if we may rely on the accounts given of its produce in Great Britain, it is the most valuable of all herbage plants. It was first brought to the notice of the English farmer by the Rev. Dr. Richardson, in 1809. The peculiar qualities of this grass are said to be—1. It grows luxuriantly in low and swampy grounds, which, but for its cultivation, would be of very little or no value.* 2. It is far more prolific than any other grass. 3. Horses,

* Should not the swampy land be first drained? If so, would it not produce other grasses?

sheep, and cattle are extremely fond of it, and actually prefer fiorin hay to any other hay whatever.

The "Complete Grazier" says that "fiorin may be laid down in the months of September, October, and November. The land should be laid completely dry, and if the soil to be lain down be a ley, it should be summer fallowed, and all stones, roots of weeds, and other rubbish, carefully gathered and removed." When the surface of the ground is well pulverized, it is generally laid into ridges; small drills, an inch or two deep, and six or nine inches asunder, are to be drawn along its surface, with a hand or horse-hoe, or on soft lands with the hoe-rake. In the bottom of these drills, the fiorin shoots, either long or short, are laid lengthways, so that their ends may reach each other; then lightly covered with a rake, and rolled, to render it fit for the scythe. In six months the whole surface will be covered with verdure. It may be also raised from the seed. When it takes possession of wet clayey soils, its roots penetrate to a considerable depth, and from their vivacious properties, it is very difficult to extirpate them.

The "Farmer's Assistant" says it is a native of this country, and states on the authority of a Mr. GREEN, that it was growing twenty years since, in great profusion, in the neighbourhood of Albany. The late Judge PETERS, the enlightened and able advocate of agricultural improvement, introduced it in Philadelphia county in the year 1812, by importing a quantity of the strings from Ireland. But for some reason its cultivation was not persevered in; and, at present, we believe, it is almost wholly unknown to American practice. It is not a grass to be connected with alternate husbandry, for after it has obtained a footing in a suitable soil it is scarcely to be eradicated.

10. *Smooth Stalked Meadow Grass,*

Is a native plant, and better adapted to laying down permanent pastures and meadows than any other grass, with the exception perhaps of rye grass. According to SCOLE, an eminent farmer, it is the best of all the grasses; its foliage begins to shoot and put on a fine verdure early in the spring, but not so soon as some other grasses. Every animal that eats grass is fond of it, while at the same time it makes the best of hay, and affords the richest of pastures. It delights in rather a dry than a moist soil and situation; but it thrives most luxuriantly in rich meadows. It was of this grass that the American prize bonnet, in imitation of Leghorn, was manufactured by Miss WOODHOUSE. It yields an abundance of seed, which, in a separate state, are difficult to sow, on account of their filaments causing them to adhere together. To counteract this, they are mixed with a portion of newly slaked lime, in order to separate them; but not in such quantity as to injure the seed. They are then well rubbed in a sufficient quantity of dry sand, after which they may be sown.

This species varies considerably in size and appearance when growing in different soils and situations. In our best soils the radical leaves are very long and luxuriant—when it is known by the name of *green grass.* This has by botanists been made a distinct species, under the name of *Poa viridis;* but it is probably nothing more than a variety [very true]. It is, indeed, as MUHLENBERG terms it, "*optimum pabulum,*" being decidedly the most valuable of all the grasses known in our pastures. It has not been found necessary to cultivate it by sowing the seed; for when the land is duly prepared by lime and manure, it soon takes possession of the soil—or, *comes in,* as the farmers term it—and supersedes the artificial grasses. In very poor land it deteriorates so much, that it would scarcely be recognised as the same plant.—*Dr. Darlington's Flora Cestrica,* p. 75.

11. *Rough Stalked Meadow Grass.*

Dr. DARLINGTON says this species bears a strong "resemblance to the preceding, when growing in open grounds—but is far superior in value." In England it is held in high repute, being considered as one of the superior pasture grasses, forming a part of the richest meadows. It is nutritive, and greatly relished by pasturing animals. It delights in moist and sheltered spots; hence it is found naturally in moist meadows, and the edges of wet ditches. In dry and exposed grounds its produce is inconsiderable; and this circumstance must determine, in certain cases, the expediency of cultivating it. It is considered as one of the six best British grasses for laying down either dry or watered meadows.

12. *Fertile Meadow Grass.*

This is a native of Germany, where it is esteemed as one of the superior pasture grasses. It grows near rivers, in wet situations, and on moist grounds. It is said to perfect its seeds abundantly. Experiments are yet wanting, on the value and uses of this species, as well as many others.

13. *Annual Meadow Grass.*

This species, *Poa annua,* has an annual root; continues to flower throughout the spring, summer, and autumn, but rarely attaining, even in the most fertile situations, a height of more than ten or twelve inches, which is an objection, but overcome, however, in the estimation of English farmers, by its great produce, being the most prolific of all the grasses. We cannot recommend it with confidence to the attention of American farmers, although Mr. STILLINGFLEET says that cattle of every description are extremely partial to it; that it affords the best of hay for milch cows, and yields most abundantly. Dr. DARLINGTON is of opinion that this humble species was brought over from Europe. It is almost the only grass that will grow in towns and near works where the smoke of coal abounds.

14. *Reed Meadow Grass.*

Reed meadow grass, *Poa aquatica,* is one of the largest and most esteemed—because most useful—of the British grasses. It abounds in low, flat, and fenny countries, on the banks of rivers and the margins of pools. From its strong stem and upright growth, it is not liable to injury from inundations, and consequently suitable for those low places which are unfit from their situation for the finer grasses. It contains a much larger proportion of sugar than the best herbage grasses, and is therefore highly relished by pasturing animals. It is, however, too purely aquatic in its habits to allow of any extension in its culture.

15. *Floating Meadow Grass.*

This plant, *Poa fluitans,* is found in ditches, stagnant waters, and other moist situations, its stem varying from one to three feet in height. Its seeds are the manna of the shops, and are gathered abundantly in Poland, Russia, and some parts of Germany, where they are used as food. It is found in New Holland, a country abounding in vast marshes. It is too aquatic in its habits to become a subject of profitable culture; except in situations in which, without difficulty, it could be kept partially covered with water.—Low.

16. *Flat Stalked Meadow Grass.*

This grass, *Poa compressa,* flourishes in dry soils, and flowers from July to August. In Dr. ANDERSON's estimation, it is the best and most valuable of all the *poas.* Its dark Saxon leaves are compact and succulent, and grow so firmly together as to form a pile of the richest pasture grass. It produces a fine turf, admirably adapted to yards and lawns, and also imparts a most delicate flavour to the flesh of sheep, to which it is peculiarly grateful.

17. *Meadow or Woolly Soft Grass.*

The systematic name of this plant is *Holcus lunatus*. According to the Flora Cestrica of Chester county, it is a naturalized foreigner. It is the only species constituted here. Judge Buel says it is a *native*. Dr. Muhlenberg considers it as very valuable; but the majority of our farmers entertain a different opinion of its merits. It grows readily on all soils, especially the peaty, producing a profusion of light seeds, which are easily dispersed by the wind, from which circumstance, when it is once introduced, it is with some difficulty freed from it. It is disliked by cattle, and refused by them when other herbage can be obtained. It is also injurious to horses, when made into hay, by producing a profuse discharge of urine and general weakness. It is not an early grass.

18. *Fowl Meadow Grass.*

Fowl meadow grass, *Poa aviaria—Spicalis subbifloris*, was first discovered in a meadow in Dedham, Mass. Mr. Deane supposed the seed to have been brought there by water-fowls—hence its name. It is an excellent grass for wet meadows, and has been known to yield three tons to the acre in one season. It remains so long green that it may be mowed at any time from July till October. It makes very good hay for horses, and neat cattle particularly.—*Farmer's Assistant*, p. 128. Some botanists, and many farmers who have examined the character of this plant, think it very nearly allied to the fiorin grass.

19. *Crested Dog's Tail Grass.*

This plant, *Cynosurus cristatus*, has a wide range of soils and situations; is good for upland pastures, and affords a wholesome food for sheep. Though valuable, it cannot be regarded as one of the superior grasses. It flowers somewhat late; abounds with seed, which is easily gathered; but great care should be taken that they are fully ripe, otherwise they will not germinate. Dr. Darlington says it "makes a fine carpeting in lawns, lanes and wood yards, in the latter part of summer. Cattle and hogs are very fond of it. It rarely grows on mowing grounds." It is probably a native.

20. *Sheep's Fescue Grass.*

Sheep's fescue grass, *Festuca ovina*, is one of the smallest grasses, growing on dry, light, and elevated grounds. It is entirely an herbage plant, and is only referred to here because some botanists have spoken of it with approbation. It is a grass, however, which there can be no possible object in introducing and cultivating in arable soils in this country; as it is the interest of the farmer to stock his pastures with the best grasses which they are capable of producing.

21. *Meadow Fescue Grass.*

This plant, *Festuca pratensis*, although but little cultivated, has found its way into all our best meadows and pastures amongst us. In England it takes high rank among the superior grasses. Its root is perennial and fibrous; leaves succulent, and readily eaten by cattle. It is less suited to the new system of alternate tillage than some other of the grasses, as it requires a much longer time to arrive at maturity.

It is an early perennial and very hardy grass—thriving with uncommon luxuriance in almost every soil, producing very sweet herbage, which is eaten with avidity by every sort of cattle, making excellent hay, and producing abundance of seed, which may be easily gathered. It bears a very great resemblance to the rye grass, to which it is in many respects greatly superior, at least for forming or improving meadows; as it is much longer, and more productive of foliage. It flowers about the middle of June.—*The Complete* (English) *Grazier, sixth edition*, p. 489.

22. *Floating Fescue Grass.*

This plant, *Festuca fluitans*, delights in very wet grounds; it is often found in rich swamps, bogs, ditches, and ponds; it is singular in its habit, growing as well probably in as out of the water. It flowers in June. Horses and cows especially are very fond of it, and it is said that the very superior excellence of the Cottenham and Chedler cheese is owing to this grass, as it imparts a rich and peculiar flavour to the milk of cows fed mainly upon it. It springs early, and is recommended for newly reclaimed morasses, swamps, bogs, and lands recovered from the sea. It is a native of America. This plant is probably the same as the floating meadow grass. Curtis says it is greedily devoured by every species of stock, not excepting hogs and ducks, and geese eagerly devour the seeds, which are small, but very sweet and nourishing.

23. *Hard Fescue Grass.*

The hard fescue grass, *Festuca duriuscula*, flourishes in almost any situation, wet or dry, blossoms in June, and is considered one of the best of the dwarf sorts of grasses, and suited to the pasturage of sheep. It frequently grows to the height of three, and sometimes four feet; it soon becomes thin, and disappears. It is suitable only for mixing with other grasses.

24. *Tall Fescue Grass.*

The tall fescue grass, *Festuca elatior*, is a native perennial grass, very luxuriant and productive in some sections, but not a general favourite with our farmers. It is rather coarse. Cows are fond of it, but horses reject it. It grows naturally in bog meadows, moist places, and in woods. Leaves broad, stem high, sometimes six feet, and flowers in July. Notwithstanding the unfavourable opinion entertained by botanists of this plant, we believe that, with proper care and attention, it may be brought to take rank with our most esteemed and valuable grasses.

25. *Spiked Fescue Grass.*

Festuca coliacea, spiked fescue grass, grows in moist meadows, and is said to be very productive. In England it very rarely perfects its seeds, but this, with us, would not be a serious objection to its cultivation were it otherwise useful, as seed in sufficient quantities might be readily obtained from other countries. At present, it is a stranger to American practice; and it cannot be recommended as an agricultural plant until further experiments are made.

26. *Yarrow.*

Yarrow, *Achillea millefolium*, is pronounced by the editor of the "Complete Grazier," as not only one of the most common, but also one of the most valuable plants growing in Britain.* It is also highly extolled by Dr. ANDERSON. It thrives well on moist loams, and also on the dryest soils—it is, indeed, suited to almost every soil—flowers in July and August, and, according to ARTHUR YOUNG, it is a plant every way deserving of attention.† Its great virtue consists in resisting drought.

* Complete Grazier, (sixth and last edition,) p. 479.
† See A. YOUNG's paper read before the Board of English Agriculture, vol. ii. p. 146.

We think it an error to rank this plant among grasses. It is said to be a native, but Dr. Darlington speaks of it as a foreigner, now extensively naturalized. It is an aromatic bitter and astringent, and popular as a tonic, but is regarded by our farmers as a weed.

27. *Blue Dog's Tail Grass.*

According to Mr. Curtis, the blue dog's tail, *Cynosurus cæruleus*, is the earliest of all the British grasses, flowering a fortnight before the sweet scented vernal grass. It is not productive, but endures the droughts of summer and autumn remarkably well. It is found in Scotland on the highest limestone rocks. We know not whether it is native in this country.

28. *Cichory.*

Cichory, *Cichorium intybus*, sometimes called common wild succory, is a perennial vegetable, and in the English works is set down among the artificial grasses. It is indigenous in Europe, and is becoming extensively naturalized in our country. Its value for feeding cattle, was first discovered and made known by that sincere and steadfast friend of agricultural improvement the late Arthur Young, Esq., and consequently is of but recent date (1780). It is cultivated in France as an herbage and pasture plant; and in Germany and Flanders also, for its roots, from which a substitute for coffee is prepared. It does very well on all the inferior class of soils, and thrives to much profit on bogs, and low and wet meadows; while at the same time it will flourish on the weak, thin and sandy soils, producing on such, a greater quantity of sheep food than any other plant at present known to cultivation. Those who keep a large stock of swine will find it to advantage. It answers well for soiling cattle. *The culture of this plant is the same as clover.* ☞ It is not to be cultivated for making into hay, which is said to be an objection. It is cultivated in many gardens in the neighbourhood of Philadelphia for culinary purposes. The seed is in general sown broadcast, though on poor lands it is best drilled in rows about nine inches, and on better soil twelve inches asunder, after the soil has been fully pulverized. It is then to be rolled. When sown broadcast, it only requires to be once slightly harrowed. Ten pounds of seed are sufficient for an acre. It thrives well on any soil, but is considered as an uncertain crop.

29. *Gama Grass.*

Gama grass, *Tripsacum dactyloides*, is a native of the southern parts of the United States. It has, however, been found wild as far south as the banks of the Connecticut. It is a stout and very remarkable grass—its growth and produce are prodigious—indeed almost incredible, and could not be believed were the statements not made by gentlemen in whose veracity the fullest confidence may be placed. Although stout and very coarse, all kinds of graminivorous animals, it is said, eat it with avidity. Dr. HARDEMAN, of Missouri, it appears, was the first cultivator of this plant in the United States. He states that a single root, covering a circle, the diameter of which was two feet, yielded at one cutting fifty-two pounds of green hay. We infer from this, that this plant has as great if not a greater affinity for moisture, than the willow. Mr. J. MAGOFFIN, who first introduced its culture in Alabama, where it is said to abound in its wild state, says that when all surrounding vegetation was destroyed or burnt up by drought, this grass was green and flourishing, and that during the month of July it grew forty-three inches. He cut it on the first day of each month during the drought, and it was found to range from three and a half to four and a half feet in height. The editor of the American Farmer received a blade of the gama grass in a letter, measuring thirty-two and a half inches in length, the growth of twelve days.

Plant the seed in either of the fall months, the earlier the better, in a bed or garden, or some sheltered spot. They will come up mostly in the spring. At one year transplant the roots to any description of rich soil, except a very wet one. Set them two feet apart each way, and the second year from transplanting they will quite cover the ground. The meadow will now afford a very heavy crop of grass, either for soiling or hay, once a month, for five or six months during each year. The roots penetrate the ground to such a depth as almost to defy frost or drought; this property of the root renders the grass valuable for covering the steep sloping banks of railroads and canals. If suffered to go to seed, it becomes too coarse for hay. It is also raised from the seed, but the unusual length of time it requires to vegetate its seed, is a very serious objection to this mode of cultivation.

This grass is a great favourite with many of our southern cultivators; but how it is generally received, and what progress has been made in its culture in the southern states, where alone, we presume, it can be cultivated to advantage, we are not informed.

30. *Guinea Grass.*

Guinea grass, *Panicum polygonum,* is a naturalized plant, introduced into this country many years since from Jamaica, whence it was originally derived from Guinea. It was in high repute with many of our western and southern planters some years since, but for some cause or other, at present unknown to us, its culture at the present time is almost obsolete. It was introduced more than fifty years since into South Carolina by the Hon. HENRY LAURENS, President of the Continental Congress. Though by many considered as an annual, it is a perennial plant.

The Memoirs of the Agricultural Society of Philadelphia contain several interesting papers on the subject of this plant. Among them one from Dr. BROWN, of Natchez, accompanied by certificates, stating that eight horses were kept during the growing season upon the grass cut from one quarter of an acre: a most remarkable circumstance. A Mr. OGLESBY, of Kentucky, fed six horses during the summer of 1812 on the grass grow on a quarter of an acre. He planted the second week in May, commenced cutting on the 20th of June, cut it five times over by the middle of October, obtaining from each plant, which occupied a square yard, about sixty pounds of green grass. He states that he has frequently known it to grow four inches in twenty-four hours. Mr. BRONNOUGH says it will produce more than six times the quantity of any other grass he is acquainted with.

We see no reason why this grass, if the above statements are correct, should fall into disrepute; nor why its cultivation may not be resuscitated among us to great profit in this age of agricultural improvement.

31. *Blue Grass.*

Blue grass, *Poa compressa.* This well known grass affords a most nutritious pasture, and for this reason it has of late years become a great favourite with our western farmers. It is now most extensively cultivated in Kentucky and Tennessee, and is rapidly coming into use in all the grazing districts. It grows remarkably well under cover of woodland, and is also much esteemed as an important part of the mixture of seeds in laying down lands to grass. Professor GORDON, of Clinton College, Tenn., who has with much care and patience investigated its merits, speaks of it in the highest terms of commendation. Dr. DARLINGTON says that "it is not so much esteemed as the green meadow grass, *Poa pratensis,* and is sometimes rather troublesome in the rotation of crops, by its tenacity of life." The learned Doctor thinks the blue grass of our pastures is an introduced plant. That it is a *native* plant we entertain no doubt, yet at the same time it may be indigenous to other countries. The Domestic Encyclopædia says that it is particularly proper for soiling, and that it will bear close and frequent mowing.

32. *Tares.*

The tare, *Vicia sativa*, is one of the most esteemed of the forage plants of England. It is an annual, very hardy, and has been cultivated in Europe from time immemorial. It said to be a native of Europe, where, according to Ray, a celebrated botanist, it was most extensively cultivated in 1686; but we presume that although so extensively diffused over that continent, it was originally introduced from Japan. We find mention made of it by the Jesuit missionaries who visited Japan and other islands in 1686. It is now cultivated with much success in various parts of the United States. It is a sort of pea, of which there are several varieties, one of which is distinguished by producing yellow seeds; two kinds only are cultivated in Europe—the winter and the spring tares.

The tare, by being sown in autumn or in spring, acquires habits so different, that many have supposed the spring and winter tares, as they are called, to be different species. They are, however, says Professor Low, from whom we quote, the *same* species, and do not even constitute botanical varieties. But from the different habits of ripening which they acquire, they should be always sown at the periods to which they are respectively suited—that is, the winter tares should be sown in autumn, and the spring tares in spring; for repeated experiments have shown that spring tares sown in autumn will frequently perish in the first frosts, while the winter tares remain uninjured.

Arthur Young says, in one of his Essays, "the cultivation of the tare is extending every year—its importance is better understood. The author of this Essay," he continues, "feels both pleasure and pride in having been the first person who raised them on a large scale, and publicly recommended them to the notice of agriculturists. Now, in 1821, after thirty years experience of their utility, it would be difficult for him to say more in their favour than they deserve. But he takes leave to observe that they may be made one of the principal means of enabling the arable farmer to support as much live stock as the grazier. For during the time they occupy the ground, they produce as much green food of the best quality per acre, as the richest grazing land; and the ground may be cleared of them in such good time, (June,) as to admit of raising a clean crop of either turnips, beets, rape, cabbages or potatoes, on the same soil in the same season—and even after the crop of rape, cabbages, or potatoes, or beets have been cultivated and removed, the same soil may be prepared and sown with either wheat, barley, oats, or pulse. By this means three valuable crops may be obtained in any place every two years."

The tare does best on a clayey soil, but will grow in any soil not too dry, provided it is rich. As this crop very soon spreads and covers the surface, a dry season is considered the most favourable, as in a moist climate, or when the season is unusually damp and wet, the stems grow with such luxuriance as very often to rot at the bottom; while on the other hand, if the season proves remarkably dry, the haulm is deficient in length.

When tares are sown in autumn, the preparation of the ground seldom consists of more than one ploughing, after which the seeds are sown in the usual manner and harrowed—nothing, however, would be lost by a more thorough tillage. When sown in spring, the land should be ploughed the preceding fall, cross ploughed in the spring, well harrowed, and receive a third ploughing if necessary, as it is always best to have the surface well prepared. As soon as sown the land should be well rolled, to facilitate the subsequent action of the scythe. If the spring crop requires manure it should be applied to the land and turned under the preceding autumn. It is a grand error to sow tares on land which is not clean and in good condition. When designed for green food at a late season, sow in spring—and in order to procure a succession of cuttings during summer and autumn, portions of the land should be sown at intervals from the middle of March to the end of May.

The *time of sowing* depends on the kind of tare and the object had in view in its cultivation. Fall sowing may take place from the middle of September to the 10th of November; and in spring as early as the state of the season will justify, but not until all danger from frosts is fully removed. The *usual mode of sowing* is broadcast, though they are better sown in rows like peas and beans, though this is by no means essential. The *quantity of seed* required to the acre is from three to four bushels—when intended for seed alone, two bushels and a half are found sufficient. It is customary to mix a portion of some of the cereal grasses with the tare, by which the quantity of fodder is increased—in their growth they do not interfere with each other. For winter tares, rye is recommended; for spring tares, oats or barley. The *after culture*, if sown broadcast, consists merely in keeping down the weeds; if the drill system has been adopted, the cultivator may be used between the rows, by which, in addition to removing the weeds, the soil will be kept loose.

Tares, when used as green forage, are cut after the pods are formed, but long before the ripening of the seed; and therefore, being in the class of crops most generally allowed to mature their seeds, they are not exhausting to the soil. But on the contrary, with relation to the farmer, they are to be considered as *restorative* crops, from the great quantity of manure which their consumption affords. They are exceedingly nutritious, and supply a larger quantity of food, for a limited period, than almost any other forage crop. All the animals of the farm are fond of it, and thrive upon it in an eminent degree. Hogs may be fattened entirely upon it. It is suited to milch cows, causing them to give more butter than any other species of food—except sugar-beet—and it is employed extensively in feeding horses. Tares are sometimes *eaten off* by sheep being penned upon them, but never by the larger animals.

Tare crops are sometimes *made into hay*, but this practice cannot be recommended in this country—here the great and only advantage is in their cultivation as green crops. The *produce* of tares cut green is, according to Middleton, ten or twelve tons per acre. The *produce in seed* is also considerable, varying according to the season and other circumstances, from twenty-five to forty bushels. The *use* of the *seed* is generally for re-production. They are highly relished by pigeons, and it is not unlikely that they may prove a very good food for poultry. In Germany they are fed to horses, cows, sheep and swine. The *diseases of the tare* are very few—a crop is sometimes, but very rarely, lost by mildew."

33. *Ribbon Grass.*

The ribbon grass, *Phalaris americana*, is likely to become of great value in our husbandry. It has been found to be better adapted to wet, boggy grounds than any other species of grass—to propagate rapidly either by its seeds or by its roots—to yield a very large product in hay or pasture, and to be well adapted to farm stock. The subject merits further attention, [experiments,] and if our anticipations are not irrationally founded, it will yet become the gama grass of the north.—Buel. The value of this promising grass was discovered accidentally, and is thus narrated by Abednego Robinson, of Portsmouth, N. H. "A neighbour wishing to get rid of some of the roots which encumbered his garden, threw them into a bog, where they took root and spread over a large space of ground, excluding every other plant. The water flowed through the roots at all seasons, yet the turf has become so solid as to bear a cart and oxen. I walked through this grass when in bloom, and never beheld a more handsome and luxurious growth. It stood perfectly erect, full of large leaves, even, and from four to five feet high. It will produce two good crops in a season, and springs up immediately after the scythe. It produces excellent food—cattle feed it close, and appear to be more fond of it when made into hay than any other grass." It is perennial, spreads rapidly and may be easily transplanted. It is essentially aquatic in its habits, and therefore requires a soil well saturated with water, where it will vegetate with great facility. The facts here narrated, are gathered from publications made respecting this grass in 1834.* It may be a very valuable acquisition to our present catalogue; but further experiments are necessary to determine its intrinsic value as well as its relative merits.

Of the various plants referred to in the preceding pages, some it is seen are chiefly adapted to forage, some to herbage, and others may be employed partly for forage and partly for herbage. Several of the forage plants, from their habits of growth, are best cultivated by themselves, or with a very slight intermixture of other seeds. Of this description are the tare, lucern and saintfoin when mown for forage. The trefoils, again, and the other smaller leguminous herbage plants, are greatly benefited by a mixture with some of the grasses; and it is a point of useful practice—worthy the attention of every enlightened farmer—to determine what kinds should be selected, and in what proportions they should be mixed. In England, the plants most frequently employed for producing mixed forage and herbage, are the red and white clovers—and of the native grasses, rye grass. The rye grass is well suited for general culture, arriving more quickly than most of the others at maturity, producing abundance of seeds, at all times easy to be obtained, and growing well under the shade of grain.

An excellent mixture, when the land is to remain for only one year in grass, is given by professor Low as follows: rye grass, seventeen pounds; meadow cat's-tail or timothy, three pounds; red clover, eight pounds; white clover, two pounds. A mixture in these proportions will yield a good produce for one season, whether it be used as herbage or forage. But if the land is to remain in grass, then a mixture of seeds in the

* Cultivator, vol. i. p. 72-101.

following proportions will be found advantageous. Meadow foxtail, three pounds and three quarters; meadow cat's-tail, half a pound; rough cock's-foot, five pounds; meadow fescue, two pounds; rough stalked meadow grass, three quarters of a pound; rye grass, twelve pounds; red clover, two pounds; white clover, six pounds. In this mixture the quantity of rye grass is equal to about half a bushel—and with regard to the other grasses, the proportions are such that each will, in ordinary circumstances, produce an equal number of plants. These proportions are obtained by computing the number of seeds in a given weight, and the number of each which, on an average, is found to vegetate. If desired that the rye grass should be merely in proportion with the other grasses, and that each kind should produce an equal number of plants, the following would be nearly the proportions: Meadow foxtail, five pounds and three quarters; meadow cat's-tail, one pound; rough cock's-foot, seven pounds and three-quarters; meadow fescue, three pounds; rough-stalked meadow grass, one pound and a quarter; rye grass, five pounds and a quarter. Total, twenty-four pounds.* The above are the most approved and esteemed mixtures known to English practice.

* Low's Elements, p. 435.

MANAGEMENT OF GRASS LANDS.

Besides the immediate importance of grass, its indirect but certain effect on the production of grain, by communicating additional fertility to the soil, in the alternate courses of tillage and pasturage, is a most important consideration. It seems, indeed, beyond a doubt, that the soil not only obtains a recruit of food for the nourishment of grain when cultivated, from the decayed herbage, and the manure it obtains when pastured, but also acquires a consistence favourable to fertility, while it remains in grass, defended from the variations of the seasons, under the protection of a close carpet.*

The produce of land designed for the feeding of animals, may be consumed in three ways:—1. It may be eaten upon the ground where it grows, which is termed *pasturing*. It may be cut down and given to animals while it is yet green, which is termed *soiling;* or it may be dried for preservation, when it is termed *hay*. The plants employed for these purposes are the different forage and herbage plants which have been enumerated. The clovers, and similar plants mixed with the grasses, may be applied alike to forage and herbage. They form what in common language are termed the artificial or cultivated grasses; and land, when producing them, is commonly said to be in grass. The seeds of the grasses and of the leguminous plants are sown in spring, as has been previously described, and generally upon the surface of ground sown with common grain crops. When the grain, as wheat for instance, is sown in autumn, the seeds of the grasses and clovers are sown in the ensuing spring, upon the growing crop of grain, and immediately harrowed in. But when the grain crop itself is sown in the spring, the grass seeds are also sown, just before the last turn of the harrow, which is followed by the roller to complete the process.

It is of the utmost importance that all the seeds sown are of the right kind, fresh, well and perfectly ripened; and especial care must be taken that they be free from the seeds of weeds; this point requires the greatest caution. Sowing the seed is performed either by the hand, broadcast, or by machinery constructed for this purpose. Grass seeds cannot be sown too evenly—and to ensure an even or regular disposition of the

* Sir John Sinclair's Code of Agriculture, p. 270.

seeds on the ground, many good farmers prefer sowing each kind, when applied in sufficient quantities, by different casts. They estimate the advantages of even sowing far greater than the mere extra labour and time consumed in carrying out their plans. Uniformity of delivery is a point of the greatest consequence; and the lighter grass seeds should never be sown in windy weather or in wet seasons. The *proportions* in which the different kinds of clovers and grasses may be sown together depends, as we have already remarked, on the longer or shorter period for which the land is to remain in grass.

The principal thing in the choice of grasses is, to sow only such in the same field as ripen nearly at the same time. By this means finer hay will be obtained than by any other method, and there will be much less trouble in making it.

In laying down land to grass permanently, the seeds may be sown in autumn as well as in spring, without any grain crop, it affording a quicker and better sward; but then it is by the sacrifice of a crop of grain, which is too great to be disregarded in the practice of the farm. This system, therefore, cannot be recommended, especially as there is no difficulty, under good management, of getting the seeds of grasses and clovers to vegetate under the shade of grain in sufficient abundance to stock the ground; and in the forming of the meadow, therefore, there can seldom be a reason for deviating from the simple and economical practice of sowing the seeds of the herbage and forage plants along with the crop of grain.

The seeds when sown, will quickly vegetate, the plants springing up under the shelter of the larger crop; and in autumn, when the grain is gathered, they will be found covering the surface. It is the practice of some to have the ground slightly depastured by sheep in autumn, when it has acquired sufficient growth to afford a bite; but this, in our estimation, is a bad practice. Upon no consideration whatever should heavy cattle be admitted to the field, as they would most essentially injure it; and when it is deemed necessary to have it cropped by sheep, they should be permitted to remain upon it only for a short time.

In the following season, the plants may be consumed in either of the ways already mentioned, which are as follows:—1. They may be depastured with live stock. 2. They may be mown several times during the season for green forage, and the aftermath depastured. 3. They may be made into hay and the aftermath depastured.

Permanent pastures may be divided into two kinds—rich or feeding lands, and hilly or rearing pastures. Under the former are comprehended all old rich pastures capable of fattening cattle; and, under the second, such as are only adapted to rearing them, or are more advantageously depastured with sheep.—LOUDON. *Feeding pastures* embrace such lands as are suitable for hay, and that may, at pleasure, be converted to arable husbandry. *Upland or hilly pastures*, include such elevations as are kept constantly in pasture, although they may be brought into tillage as well as those that are inaccessible to the plough. These lands generally produce a short sweet herbage, and are commonly better adapted to sheep than large cattle. *Meadow lands* are both natural and artificial—naturally moist or rendered so by irrigation. All mowing lands are, properly speaking, meadows; but when we speak of these in general, the impression is, that reference is had to low moist grounds, which, in their natural state, are adapted to the production of grass. Of meadows, there are three descriptions, river, upland and bog.

In the management of permanent pastures, weeding must not be neglected. Weeds are the manifest enemies of the farmer, they injure him in many ways. It is not unfrequently the case that they impair the health of his cattle, impart a disagreeable quality to the milk, and the butter made under such circumstances, if intended for market, meets generally with a tardy sale and an indifferent price. No good farmer, who properly appreciates the importance of the subject, will permit a weed to ripen and disperse its seed over his fields. A man who will permit noxious weeds to grow upon his farm, and mature their seeds, not only injures himself, but wrongs his neighbour, who may be a clean and thrifty husbandman, but whose fields are overrun with noxious plants by the unjustifiable carelessness of his neighbour. This is a subject worthy of the serious consideration of any farmer, and is mentioned incidentally here, on account of its importance.

To prevent the growth of moss in feeding or pasture lands, is a very nice point of practice. Harrowing and cross harrowing with tines which penetrate the earth about an inch, a sprinkling of grass seeds immediately after the operation of harrowing, followed by a top dressing of lime or compost, well prepared, are recommended as the most likely means to extirpate the moss and benefit the pasture. Ant and mole hills, if they appear, should be immediately removed,—the latter may be spread over the ground.

Upland or hilly, sometimes called *mountainous pastures*, afford, in many cases, a very rich and sweet herbage, though not in profusion. Of late, systematic farmers have in many instances, greatly improved these pastures by drawing surface drains diagonally across the face of the hills wherever injurious moisture appears, by which the herbage produced is rendered not only more palatable and wholesome, but the waters, by being conducted gently downwards, in different small channels, are prevented from cutting those deep chasms in the hill sides, which not only disfigure the surface, but in times of heavy rain very essentially injure the pastures.* The author we now quote observes:—

The *next* great improvement of which such pastures are susceptible, is that of filling the soil with the earliest and most productive plants adapted to the soil and climate. For this purpose, the ground where it will admit of cultivation, should be laid down, after being well limed, with a suitable mixture of the most useful varieties of grass seeds. Rye grass, red and white or Dutch clover, with the later flowering gramina, are recommended. There is no mode by which upland pastures are more effectually improved, than by the application of lime, either spread upon the surface [as a top dressing], or mixed with the soil. In the latter case, it is essential that the lime should be mixed with *the surface soil only*.

Among the rules which judicious farmers practice in the management of upland pastures, the following deserve to be selected:—1. To enclose those pastures; as the same extent of land, when sheltered, will feed a greater quantity of stock, and to better purpose, than when in an open or exposed state. 2. Not to overstock upland pastures; for when this is done, the cattle are not only starved and the quantity of herbage diminished, but the soil is impoverished. 3. When enclosed and subdivided, the stock ought to be shifted from one enclosure to another, at proper intervals. This practice tends to increase the quantity of grass which has thus time to get up—and the ground being fresh and untainted when the stock return to it, they will feed with greater appetite and relish. 4. The dung dropt by stock while feeding should be spread about. 5. Where the large and the small animals are to be fed on the same pastures, the larger species should have the first bite. 6. It is not thought by some advisable to pasture land with a mixed collection of different kinds of live stock: and it is generally found that the grass produced by the dung of cattle or horses is injurious to sheep.—*Sinclair's Code of Agriculture.* For further observations on mountain and upland pastures, see article Grazing.

The rules for the management of rich grazing lands, or feeding pastures, are few, simple, and of easy execution. SINCLAIR recommends a top dressing of soot, ashes, lime, maltdust, &c. as highly beneficial when suited to the soil, which should be ascertained by experiment before much expense is incurred. He also recommends the application of manure in the form of a well prepared compost, at the rate of from thirty to forty cubic yards per acre; while on the other hand LOUDON says that the application of manures to grazing lands, which not being used as hay grounds, afford no means of supply, may certainly be considered as a preposterous practice, and one that must be ruinous to the other parts of the farm.

Attention to the weeding of grass lands has been already recommended and is now enforced. It is necessary also to clear them of all rubbish and extraneous substances calculated to interfere with the growth of the young grass, that may injure the stock if pastured, or obstruct the scythe should it be used.

* SINCLAIR'S Code of Agriculture, first American edition, p. 270.

Rolling is in some cases indispensable, and should be omitted only when it has a tendency to increase a too tenacious state of the sod, which by farmers is termed *hide bound;* in this case, scarifying the turf with a plough consisting only of coulters or harrow teeth, so that the entire surface may be loosened, is to be recommended. This operation is undoubtedly useful, especially when preceding the application of manures, which have a more ready access to the roots of the grasses, thereby, in the opinion of Sir JOHN SINCLAIR, obviating in some measure the objections to that practice.

Cattle nor horses must never be permitted to enter or remain upon feeding lands of a retentive quality in wet seasons—the injury the best lands have received from this practice is incalculable. "Every step heavy cattle take leaves an impression which rain fills with water, and then the whole stands full like a cup. This wetness destroys the herbage, not only in the hole, but that also which surrounds it; while at the same time the roots of the grasses, as well as the ground, are chilled and injured. No good farmer, therefore, will permit any cattle to set foot on such land in wet weather, and few during the winter months under any consideration." Rich pastures, on which cattle feed well and thrive, should not be mown, but retained as grazing lands.

It is an important maxim in the management of grazing lands, not to adopt the plan of mowing and feeding alternately. To maintain a proper quantity of stock, the land must be accustomed to keep it:—the more it has kept the more it will keep—four sheep this year, five the next, afterwards more with the addition of manure. Land that has been used to the scythe, will often produce more grass, but that will not, it is thought by some, support so much stock, nor fatten them near so well as an old pasture, though it may have been better manured. Nor will old pastures produce as much hay as the other, for each will grow as they are accustomed to grow, and will not readily alter their habits.—SINCLAIR.

It is a very nice point of practice to ascertain the cases in which cutting or feeding, or in other words, soiling or grazing, is the most beneficial. It depends entirely upon situation and circumstances. The practice of soiling has certainly great advantages over the more common, and almost universal system of allowing the animals to find their own food in the fields; yet in many cases it is not practicable, and in certain other cases not expedient. The cases in which it is not practicable, according to Professor Low, are when the land does not possess a sufficient degree of natural or acquired fertility to produce good and early crops of grass, or when sufficient straw to litter the animals during the period of feeding cannot be obtained. The cases in which soiling, though practicable, is not expedient, are, when the animals to be fed require exercise to preserve them in health and in a growing state. *See article Soiling.*

An eminent agriculturist observes that there seems to be a season sometime during the year, when grass lands, particularly old turf, should be eaten very close, not merely for the sake of preventing waste, but also for the purpose of keeping down the coarser kinds of plants, and giving to the pastures as equal and fine a sward as possible. The Farmer's Assistant says that good meadows are often spoiled by close feeding in the fall; that many farmers feed them in the spring until their upland pastures are grown, by which means the meadow is poached, and the roots of the grass so torn to pieces, that not more than half a crop may be expected, which would be realized by pasturing moderately in the fall and *mown* in the spring.

Water for stock is indispensable; therefore every field under pasture should be well supplied with it, and also shelter and shade. In Germany and the Netherlands, portable sheds are in extensive use; and generally a part underneath to which is affixed a lump of rock salt for the use of the pasturing animals. We would, however, recommend a few trees in clusters; the sugar-maple would answer very well.

Meadows. We have already remarked that there are three descriptions of meadows. 1. On the banks of streams and rivers. 2. On the uplands or elevated grounds. 3. Bog meadows.

River meadows are by far the most prolific and valuable, yielding grass and hay in abundance, and producing an everlasting source of manure for the enriching of the adjacent grounds. They are very extensive in many parts of this country; soil deep and rich, mostly alluvial, being deposited by the water or washed down by repeated and heavy rains from the adjoining eminences. The principal defects to which such lands are liable, is the oozing out of springs at their junction with the rising grounds and inundations of the river or stream. The latter is easily remedied by a proper system of embankments; and the former by cutting a drain at a suitable point sufficiently deep to carry off the water to other conductors. By this means the springs are tapped above, and the surplus water instead of deluging the meadow to its injury, is carried off by a very cheap, simple and effectual process. It may be necessary, however, in some cases, to adopt a system of under-draining, which see. These are the only meadows to which the system of irrigation can be profitably applied.

Upland meadows or mowing grounds rank next in value to the water or river meadows. The soil is either not usually good, or is rendered so by artificial means, for which purpose —that is, to bring them up to a high state of fertility—ample supplies of manure are requisite; the best mode of application is by way of top dressing. Upland meadows require much more care and attention than those of the valleys, which we have here denominated river meadows. In manuring upland meadows, the farmer will act with great caution—much is left to his judgment, as he alone is determined by the state of the season, the kind of manure to be used, the quantity and frequency of its application.

Bog meadows are the least esteemed of any. The term includes marshes, swamps, or bogs, producing naturally only rushes, sedges, and the larger and coarser grasses. These marshes are of every degree of natural fertility. The marshes along our extended sea-board are frequently rendered highly productive and of great value. The lowest for the most part in the scale of fertility of these wet lands, and yet of great importance in elevated districts where they abound, are those which consist of a thick bed of peaty matter. These lands are generally susceptible of improvement by draining, and may be rendered very valuable, and from producing a scanty, coarse, unpalatable herbage, may be made to yield an abundance of fine, sweet and nutritious grass. See Experiments in Reclaiming Wet Meadows and Bogs.

As the soil of these wet lands improves, so for the most part does the natural produce which it yields. It is frequently a question of expediency whether a marsh shall be broken up for tillage or allowed to yield its natural plants. It may produce a great deal of manure, without requiring any; and it may furnish a valuable resource for wintering stock—yet it may not be capable of being fitted for cultivation but by a very large expenditure of capital. The manner of preparing the hay of these grounds, is similar to that of preparing the hay of the grasses. See article Hay-making.

A very great diversity of opinion has prevailed with respect to the *breaking up grass lands*, with a view of restoring them afterwards, or remaining permanently under cultivation. So important was this subject considered, that the British Parliament, a few years since, requested the Board of Agriculture to institute an inquiry as to its influences and effects, both in a national and individual light. We find the Board of Agriculture, in compliance with a requisition from the House of Lords, instituting in the year 1800 a very particular and extensive inquiry "into the best means of converting certain grass lands into tillage, without exhausting the soil, and of returning the same to grass, after a certain period, in an improved state, or at least without injury." An immense mass of the most important and satisfactory information was collected—the *essence* of which will be found in the following synopsis, prepared by Sir JOHN SINCLAIR, and published in his valuable work.

Rich permanent pastures. There are various sorts of grass lands that ought not to be broken up, as water meadows, salt marshes, lands apt to be overflowed, lands near large populous towns, where the produce of grass land is always in demand, and consequently dear—and low lying tracts, in the valleys of mountainous countries, (particularly in chalky districts,) where old meadow land is scarce, and where a portion of it, to raise early and late food for stock, gives a great additional value to the adjoining upland. But whether land that has long remained in a state of turf, and continues productive, should be converted into tillage, is a question respecting which a great diversity of opinion has been entertained.

It is proper here to give a concise description of the nature and quality of the several sorts of land usually retained in the state of permanent pasture, the conversion of which into tillage has been so much deprecated; and also a short statement of the advantages which such lands are considered to possess.

The lands which are accounted to be the best adapted for permanent pasture are of three kinds: 1. Strong tenacious clays, unfit for turnips or barley, which are said to improve the more the longer they are kept under a judicious system in grass.* 2. Soft clayey loams, with a clayey or marly bottom or substratum; and, 3. Rich, sound, deep-soiled land, or *vale land*, enriched by nature at the expense of the higher grounds, generally lying in a situation favourable with respect to climate.

The advantages of such pastures have been represented in the strongest light. It is affirmed that they feed cattle to a greater weight; that they are not so easily scorched by the summer's drought; that the grasses are more nutritive both for sheep and cattle; that milch cows fed upon them give richer milk, and more butter and cheese; that the hoofs of all animals feeding upon them are much better preserved; that they produce a greater variety of grasses; that when properly laid down, they yield a succession of pasture throughout the whole season; that the herbage is sweeter, and more easily digested; and that they return an immense produce at a trifling expense.

To break up lands possessing these advantages, it is said, nothing can justify but the most urgent necessity, and to prevent the horrors of famine.

The real value of such lands will appear by considering their rent and produce.

The grass lands in Lincolnshire are accounted the richest in the kingdom. The rents are various, from 1*l*. 15*s*. to 3*l*. per acre, and the value of the produce from 3*l*. per acre, to 10*l*. 8*s*. From an average estimate, referring to several farms, it is proved that a rent of 14*l*. 6*s*. per annum, gives a produce of 38*l*. 19*s*. 4*d*., and that for every 20*s*. of produce, the landlord takes 7*s*. 7*d*. in rent. The highest produce per acre arising from beef, mutton, and wool, is at the rate of 10*l*. 8*s*., and is obtained, subject to little variation from the nature of the seasons, and at a trifling expense.

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* This assertion is thus explained. In the course of years, on the surface of such a soil, there is formed a rich, light, black mould, two or three inches in thickness, which is the matrix of these rich grasses. When the soil is ploughed up, this valuable surface is mingled with the colder and less fertile strata below, and cannot be renewed for many years. *Young's Essay*, Communications vol. iii. p. 191. It is contended, on the other hand, that strong clays do not improve when first sown down with grass; and that by repeated trials, it has been completely ascertained, that such soils will yield as much grass the first year after they are sown as in the two following years. Hence, instead of keeping them in grass, it is desirable to break them up often, and to stock them with fresh plants. *Communication of Robert Brown, Esq., of Markle.* But if a rich surface *has been got*, should it be destroyed?

The stock maintained per acre *on the best grazing lands*, surpasses what could be fed by any arable produce. It is not at all uncommon to feed, at the rate of from six to seven sheep (24 pounds a quarter) in summer; and about two sheep in winter. Thus a considerable quantity of meat will be produced, besides above forty pounds of wool. Such lands, it is evident, cannot be better employed than in feeding stock.

Grass lands of the first and second kinds, the *tenacious clays* and *heavy loams*, when brought, in a succession of years, or perhaps of ages, *into a state of great productiveness*, cannot be ploughed, without the risk of great injury, and are more profitable in the productions of herbage, than they could be in the production of grain.

Lands of the third kind, or *the deep-soiled vale lands*, would be productive of grain if ploughed; but would probably be injured by cultivation; from their texture being altered and rendered unduly loose and open by tillage; from the native plants being more or less destroyed or enfeebled; and from the great decomposition, and waste of the principles of fertility resident in the soil.

The extent of these three descriptions of lands, however, is not so great that the advantages of breaking them up could probably ever be a national object, or worth the risk of injuring their future productiveness in grass. But there are grazing lands of an inferior sort, which are too apt to be confounded with those already described, and respecting the propriety of occasionally appropriating them to arable culture, there can hardly be a doubt. Such lands do not depend upon their intrinsic fertility, but upon *annual supplies* of manure, derived from the arable land in their neighbourhood.

The question then, is, whether it is most for the advantage of the parties interested, that one-half of a farm should be in perpetual grass, and the other half in perpetual cultivation; or the whole alternately, under grass and grain, and subject to convertible husbandry, with the exception of the rich grazing lands above described.

The objections to the division of a farm, one-half into *permanent grass*, and the other half into *permanent tillage*, are not to be surmounted. The arable is deteriorated by the abstraction of the manure it produced, if applied to enrich the grass, while the greater part of the manure thus employed is wasted; for spreading putrescent substances upon the surface of a field is to manure not the soil, but the atmosphere, and is justly condemned as the most injurious plan that can be devised in an arable district. The miserable crops of grain produced where this system prevails, sufficiently prove its mischievous consequences.

So injurious is this mode of management, that, in the opinion of the most intelligent farmers, the landlord loses one-fourth of the rent he might otherwise have got for every acre thus debarred from cultivation; while the public loses three and three quarter bushels of grain for every fourteen pounds of beef or mutton thereby obtained.

This is a point that cannot be too much inculcated in a country increasing in population, and which finds so much difficulty in maintaining its inhabitants. For with the exception of rich pastures, arable land is on an average superior to grass land, with respect to furnishing articles of human food, in the proportion of three to one; and consequently every piece of land unnecessarily kept in grass, the produce of which will only maintain one person, is depriving the community of food capable of sustaining two others of its members.

Landlords in many parts of England are apt to be apprehensive, (and often with too much reason,) that their property may suffer from a change of system; and it is much to be lamented, that the law in England affords them very inadequate protection against bad tenants. Were it not for this circumstance, the interests of the landlord might be guarded against injury by judicious covenants, and by prescribing an improved mode of management. A regular system of convertible husbandry might thus be established, while the value of landed property would not only be greatly augmented, but the true interests of the country be most essentially promoted.

The principal objection to the conversion of meadow into arable land, arises from an alleged inferiority in the new when compared to the old herbage—a complaint which probably originates either from the improper choice of seeds, or from giving them in too small quantities—thus favouring the growth of weeds. A gentleman who had a large farm, principally consisting of strong rich clay, (every field of which, with hardly an exception, he occasionally broke up,) was accustomed to lay them down with a crop of barley, and to sow fourteen pounds of white clover, a peck of rib-grass, and three quarters of hay-seeds per acre. By this liberal allowance of seed, he always secured a thick coat of herbage the first year, which differed from old pasture—*only in being more luxuriant.* Such lands, therefore, under judicious management, will rarely be injured by the plough. When laid down from tillage into grass, they may not carry, for the first year or two, such heavy cattle as they would afterwards, but it will support *more in number*, though of a smaller size, and bring a greater weight of butcher meat to market.

It is often desirable to keep one or two moderate sized inclosures of from ten to twenty acres, according to the size of the farm, in perennial pasture for the feeding of cattle and sheep, and as a resource for the stock to go to, in case of a severe spring or summer drought; but the retaining of any considerable portion of a farm in old turf or permanent pasture, unless of the richest quality, is, in general, injurious to the proprietor, the tenant and the public. The value of any estate, where the system of permanent pasture has been carried to an unreasonable extent, may be easily and greatly augmented by appropriating the manure of the farm to turnips, beets, and other green crops, and by the adoption of the convertible system of husbandry.

There are cases, however, where this doctrine, though in general to be recommended, ought not to be carried to an extreme. It is remarked, where the land is commonly light, and where sheep are both *bred* and *fed* upon the same farm, a proportion of permanent pasture is essential. Much injury in particular has been sustained by breaking up permanent pastures on such soils. A farm in general lets best with a fair proportion of grass land upon it, which admits of a mixed management, in consequence of which, if one object fails, another may be successful.

According to the improved system of laying down lands to grass, the land ought to be made previously as clean and fertile as possible. Therefore all the green crops raised ought to be consumed upon the ground—fallow or fallow crops ought not to be neglected, and the whole straw of the grain crops should be converted into manure and applied to the soil that produced it. Above all, the mixing of calcareous matter with the soil, either previously to, or during the course of cropping, is essential. Nothing, in general, improves meadows or pastures more than lime or marl. They sweeten the herbage, render it more palatable to stock, and impart to it more nourishing qualities.

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In the second season of the grasses—and there is no period in their growth when they will afford so early and rich an herbage as in this—the second year after they are sown, or when, in the language of farmers, they are one year's old grass, the plants may be consumed in either of the three ways already mentioned:—1. They may be made into hay and the aftermath depastured. 2. They may be mown at intervals during the season for green forage or soiling, and the aftermath depastured; or, 3. They may be depastured with live stock.

I. HAY-MAKING.

The making of hay in a proper manner, is a very nice process; none more so perhaps in the whole economy of the farm. Much depends upon the *period* of cutting; it must, however, be determined by the growth of the plants. But it is a common error to allow them to stand too long. They ought to be cut before their seeds are fully formed, that the rich and nutritious juices they contain may be to as great an extent as possible retained in the hay. When the stems become hard and sapless, by being allowed to bring their seeds towards maturity, they are of little more value, as provender, than an equal quantity of the finer sort of the straw of grain.*

On the other hand, it is equally injurious to grass crops to cut them *too early*, as the sap not having properly circulated throughout the blade, the grass, when converted into hay, shrinks, and is materially reduced in point of quantity. The best time for mowing valley or intervale meadows, is when the grass is in full blossom; with respect to upland and other grass grounds, when the tops of the grass appear brown it may be considered as in a proper state for cutting. But Professor Low, in referring to the subject, and speaking of the grasses collectively, says, when the plants are in full flower, but before the seeds are ripe, or even before the flowers of the clovers have begun in any degree to fade, the crop is to be mown.

Another criterion for directing the farmer's attention to this business, where the 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 comes into full flower. In this case also, it will be necessary, as speedily as may be 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 quantity of the produce may be increased by permitting the grass to ripen its seeds before it is cut, yet the value of the aftermath will be generally injured in a greater proportion than the increased quantity thus gained; besides the impoverishing effects of the plants on the soil, and the less palatable quality of the hay.

In mowing, the plants, by the action of the scythe or the improved mowing machine,‡ are laid in swarths, with their heads lying pretty regularly in one direction. The swarths lie for a short time to wither, and are then turned gently over

* Encyclopædia Britannica, art. Ag.
† See SINCLAIR'S *Hortus Gram. Woburn.*, 3d 8vo. ed. p. 214.
‡ NUPEY.

by a fork or the handle of the hay-rake, but in such a manner that they shall not be broken or spread abroad. After remaining in this situation, say twenty-four hours, or more, if necessary, they may be put into small heaps or cocks on every third or fifth ridge, according to the bulk of the crop, the ground being at the same time very carefully raked. In mowing, one of the first principles of economy is to keep the scythe constantly sharp, and perfectly fast on the snath, for the least looseness here increases the labour to an oppressive degree. Grass should be cut as close to the ground as possible, as an inch at bottom will yield more good hay than several inches at top. Hence the importance of smooth meadows. Lads and young mowers should not work in company with experienced workmen.*

When the swarth, as we have already remarked, is thoroughly dry above, it is to be very gently and carefully turned over, (not *tedded* or scattered after the old but very erroneous system,) without breaking it. The implements used for this purpose are described in the preceding paragraph; but some farmers are so anxious to prevent the swarth from being broken, that they will not permit the use of the rake-shaft. The more the swarth is kept unbroken, the hay is the greener and the more fragrant.

It is good practice to put up the hay green in these first cocks, and then to enlarge them by adding two together. If at this early stage they undergo a degree of incipient fermentation, it will do no harm, as it is in the latter stage of the process that heating or fermentation becomes hurtful. When the hay has become dry in the cocks, the period of which will depend upon the weather, they are made into ricks in the fields. The cocks are dragged together by a horse with a rope, one end of which is attached to one of his traces, and the rope being brought round the base of the cock, the end thereof is fastened to the other trace, by which means the removal of the cocks is very easily accomplished.

* Genesee Farmer, vol. v. p. 210, where we find it stated, by the intelligent editor, that experience and attentive observation, shew that hay is best when cut *late*. Some kinds of hay, more especially clover, may be partial exceptions. *Late cutting possesses several advantages.* The hay is found to contain a greater quantity of effective nutriment, as is proved by the fact that cattle keep in better condition when fed upon it. It is also much more palatable, and is eaten with greater avidity by cattle and horses. In addition to this, it is much more easily made, requiring far less drying, and thus greatly diminishing both labour and care in the process. Nor is this all. The effect upon the roots, which are to produce the succeeding crop, is by no means to be overlooked. Many plants are destroyed by cutting off or moving them while in flower, which would be little injured if the operation were deferred till the seed is ripe.

These ricks are made by a person standing upon them to build and compress them. They are formed with a conical top, and are each bound down with a rope made of the hay itself. In this state, if properly made, they will resist a considerable fall of rain; but, it must be remembered that the hay is not to be suffered to remain longer in the ricks than is necessary to dry it in a sufficient degree to fit it for storing in the barn or in larger stacks. This is the English practice, and prevails in some parts of our country.*

When hay is put into stacks, as is very frequently the case, the greatest care and nicety is to be observed in their construction; the stacks should be well thatched with straw, and present a neat and workmanlike appearance. But hay, when placed in large masses, will generally undergo a slight degree of heat. In the case of the clovers and grasses, the slighter the better; and hence the necessity of a previous preparation of the material as careful as the state of the weather will allow.†

Great difficulty is often experienced in the processes of the hay-harvest by the wetness of the weather. In such cases the farmer is obliged to watch the favourable intervals, and employ every practicable means to forward the operations and secure the crop. Some persons recommend the strewing of salt upon the hay, as the building of the stack proceeds. This is a good practice, as it corrects the tendency to fermentation, and renders injured hay palatable to stock.

In the making of hay, the great end to be aimed at is to prepare it as quickly as possible, and with as little exposure to the weather, and as little waste of the natural juices as circumstances will allow. When we are enabled to do this, the hay will be sweet, fragrant, and of a greenish colour.

The common method of curing clover hay is bad. The object to be obtained is to cure the hay in the *cheapest* and *best* manner. The practice [heretofore generally followed] of spreading from the swarth, causes the leaves and blossoms to dry and crumble before the stems are sufficiently cured, by which means the finer parts of the hay are lost, or the crop is housed with so much moisture, as to cause it to heat and often to spoil. Clover should only be spread when it has become wet in the swarth, and should be gathered again before the leaves dry and crumble. Both these evils may be avoided and labour saved withal, by curing the grass wholly in swarth and cock. After experiencing the serious disadvantages of the old method, I adopted that I am about to recommend, and have pursued it satisfactorily for fifteen years.—Judge Buel.

My practice has been, to leave the clover to wither in the swarth, and when partially dried, either to turn the swarths, or to make grass cocks the same day, so as to secure the dried portions from the dew. That which is not put into cocks the first day, is thus secured the second day, or as soon as it has become partially dried. These grass cocks are permitted to stand one, two or three days, according as the weather is, and as the curing process has pro-

* Professor Low's Elements, p. 451. † Ibid.

gressed, when they are opened at nine or ten o'clock on a fair day, the hay turned over between eleven and three, and soon after turning gathered again for the cart. Thus cured, the hay is perfectly bright and sweet, and hardly a blossom or leaf wasted. Care is required in making the cocks. The grass is collected with forks and placed on dry ground, between the swarths, in as small a compass as convenient at the base, say two or three feet in diameter, and rising in a cone to the height of four or five feet.—*Ib.*

The advantages of this mode of curing clover are:—1. The labour of spreading from the swarth is saved. 2. The labour of the hand-rake is abridged, or may be wholly dispensed with, if the horse-rake is used to glean the field when the hay is taken off; the forks sufficing to collect it tolerably clean in the cocking process. 3. It prevents, in a great measure, injury from dew and rain; for these cocks, if rightly constructed, (not by rolling,) will sustain a rain of some days—that is, they have done so with me—without heating or becoming more than superficially wet. 4. Clover hay made in this way may almost invariably be housed in good condition; and if rain falls after the grass is mown, the quality of the hay is infinitely superior to what it would be under the old process of curing.—*Ib.*

The *rationale* is this. The outside of the clover parts with much of its moisture while in swarth; and what is called the sweating, in cock, is merely the passage of moisture remaining in the succulent stocks, to their exterior, and to their leaves and blossoms—it is a diffusion—an equalization of the remaining moisture in the cock. When this has taken place, evaporation is greatly facilitated, and the whole mass acquires a uniform dryness, on opening the cocks to the influence of the sun and winds, if too long an exposure is guarded against. Evaporation progresses in the cocks, after the hay is gathered for the cart, and during the operation of loading and unloading.—*Ib.*

The late John Lorain, a philosopher and a practical farmer, after stating the advantages he had observed arising from the practice of curing hay in the swarth, namely, a saving of labour; that the grasses are turned at all times very expeditiously; that by turning the swarths throughout long continued rains, so long as the undersides of them were likely to be injured by fermentation, he had saved extensive fields of hay, while his neighbours, who gave no attention to this interesting subject, had their crops entirely ruined. After stating these advantages—advantages in which he had personally participated—he says in the very next paragraph, that *"curing hay in swarth, to save the juices, seems to be not only practically wrong, but also opposed to reason."*

Salt hay in this country has usually been burnt by lying too long in the swarths. The method in which I have treated it for several years, is to cock it the day after it is cut, and carry it in, without delaying more than one day, and put a layer of some kind of dry straw between load and load of it in the mow, to prevent it taking damage by over-heating. The straw contracts or imbibes so much of its moisture and saltness, that the cattle will eat it very freely; and the hay is far better than that made in the common way.*

* Dean's New England Farmer.

II. SOILING.

No question is now entertained as to the great utility and consequent advantages arising from the soiling of cattle, when reduced to a correct system and conducted on judicious principles. One reason why the practice of soiling is not more generally adopted in this country at the present time, may be owing in a great measure to the warm recommendations of its friends some thirty years since, who urged it upon farmers in all parts of the country, before sufficient experiments had been carefully made to determine the best methods, and the kinds of grasses most suitable to the object. In consequence, the well-meant efforts of its advocates and friends were frustrated, for a season, and the system abandoned by most, if not all, of those who had entered upon it.

But its failure at that early day, must not be attributed wholly to the cause assigned above. There were other and powerful counteracting influences. The great mass of the community opposed, and that most strenuously, the introduction of improvements, however important and beneficial, as innovations on the old established system (such as it was) of farming; and their prejudices, according to LORAIN, were too deeply rooted in favour of perpetual meadows or grass grounds, so much so as to prevent impartial reasoning on this or any other subject.

Whether, in any case, a field of young grass shall be applied to herbage or forage, is dependent wholly on considerations of expediency and profit. If there be stock upon a farm requiring good and early grass, it may be most advantageous to use the new grass for herbage—in certain cases it may be more advantageous to employ it in soiling—in others, to convert it into hay. In the practice of the farm a portion of it may be advantageously applied to all these purposes.

When the grasses, clovers, or other forage plants are to be used for soiling, they are to be cut with a scythe, and carried directly to the place of feeding, and placed carefully in a crib or rack—the animals being at the same time well littered with straw. The latter is not only an important, but an indispensable requisite to the success of the system.

The system of soiling was derived originally from the Netherlands. It is a very old, though by no means a universal practice. We find it mentioned so long back as the year 1650, in a Treatise on Agriculture, entitled "*Hartlib's Legacy*," p. 245, and in all thickly settled parts of the continent it is now coming into extensive practice. As a country becomes populous, well cultivated and rich, soiling is the mode of feeding cattle, which must ultimately prevail. On this principle it is, that we find it practiced in the vicinity of cities and large towns. But although it is the most profitable system of feeding where it can be adopted, yet, as was remarked in the article on the Management of Grass Lands, it is in some cases not practicable, and in others not expedient.

Professor Low says, that the cases in which it is not *practicable*, are when the land does not possess a sufficient degree of natural or acquired fertility to produce good and early crops of grass; or when a sufficiency of straw to keep the animals dry and well littered during the period of feeding cannot be obtained. The cases in which soiling is not *expedient*, although practicable, are, when the animals to be fed require exercise to keep them in health and in a growing state. Some say that the practice is unnatural—that animals reared on this system are deprived of air and exercise, and the selection of their food; and in the experience of some farmers, cattle thrive much better in the fields or open air, than when housed.* But the principal objection is easily obviated by allowing sufficient yard room for exercise, air, &c.

On the other hand the advocates of the soiling system say—*That it is a considerable saving of land;* that is, one acre of cut grass soiled being equal to three acres of the same field pastured. The grasses grow much more rapidly in consequence of not being trampled upon. *It is a great saving of food,* for when, say the compilers of the Complete Grazier, "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." If the consumption of plants is an object, that object is obtained by soiling, for all who have paid attention to the subject must have observed that cattle will readily eat plants cut, and given to them when housed, which they would discard in the pasture; yet, according to the authority above quoted, it is known that they will eat food, when thrown to them on the ground, which

* It is not to be wondered at, that cattle that have been accustomed to run at large and select their own food, should for a time refuse to eat the best grass, when cut and given to them in the shed or yard, when first put up. Neither is it surprising that some will not fatten at all under such circumstances. Mr. Lorain says the cause is evident: "The previous habit of the animal is entirely opposed to the sudden change—from being accustomed to run at large and gather such plants, or such parts of them, as are most agreeable to its taste. Experience also teaches us, that men, as well as the inferior animals, when deprived of that portion of liberty to which they have been accustomed, repine, and, in some instances, actually die from this cause alone."—Page 311.

they will reject when given in the stall. Many of the grasses which are sweet and succulent when young, and which cattle eat with the greatest avidity, are quite offensive when suffered to get into ear, and are thereby lost; but by this system of cutting, no loss can occur from this quarter. Plants rejected by one class of animals, when presented to them, even when housed, are not on that account less acceptable to others; indeed they appear to be eaten with greater avidity. "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."

It is contended by the friends of the cutting system that the balance, so far as regards the *health and comfort of cattle*, is decidedly in its favour over that of pasturing.—Cattle are not only less liable to accidents, but do not suffer the same inconveniences or annoyances to which they are subject when exposed to the sun in the open air—they suffer much less from heat, flies, &c., and it is perfectly reasonable to suppose that they take on flesh more readily. Tranquillity and ease are essential, otherwise animals cannot thrive. An instance in point has been cited, from which it appears that animals housed for fattening, and well fed, did not take on fat, owing to the circumstance of their becoming lousy, in consequence of fowls roosting over them. The reason why they did not thrive is obvious—when cleansed of the vermin they fattened well. Heat, restlessness, the terrible annoyance of flies, &c., when cattle are exposed, as they must frequently be in pastures, operate against them.

It is asserted that the proportioned increase of manure obtained by soiling and stall feeding abundantly evince their superiority over pasturing. "Manure is the life and soul of husbandry; and when tillage is an object of attention, there can be no comparison between the two modes of consumption, especially in regard to manure obtained by soiling live stock during summer with green food, for in consequence of the increased discharge of urine during that season, the litter, of whatever substance it may consist, is speedily converted into dung."

The late Mr. Lorain after many years experience, recommends this system of management in the highest terms. He was, in connection with the late Judge Peters, an early and ardent advocate of the convertible system of husbandry, and was of opinion that, by the addition of soiling to that system, the practice of agriculture would be as perfect as our present knowledge of that art, and the instruments best calculated to effect the labour, would admit. Mr. LORAIN's high estimate of the soiling system, as we have observed, was the result of years of experience, and the most careful investigation. The following is the substance of his opinion:

Soiling will not only save much more than half the grass necessary for pasturing the stock, but it will also introduce a great additional quantity of manure. The manure thus obtained is not only greater in *quantity*, but much superior in *quality*, is secured from injury and applied in that manner deemed most beneficial to the farm. When soiling is practiced the grounds are not hard trod, and sunk into holes by the feet of cattle. The working horses and cattle are always at hand; and, as they have no trouble in collecting their food, they are quickly filled, and soon ready for service. When live stock are confined in well fenced yards, the farmer may sleep quietly —his crops are not injured by their breaking into his fields. Division fences, too, are saved; they are costly and a nursery for weeds.

Mr. NICHOLSON, in his Farmer's Assistant, refers to a communication from Professor VON THAER,* of Hanover, detailing the result of the experience of Baron DE BULOW and others. The experiments made, run through a series of years, and are represented by the learned Professor as highly satisfactory, fully establishing the superiority of the system over all others adopted for the feeding of cattle on green forage or herbage. From the great mass of testimony thus collected, Dr. VON THAER lays down the following as facts, which he says are incontrovertible; and numerous subsequent experiments, both in Europe and this country, fully confirm this opinion.

1. A spot of ground, which, when pastured, will yield only sufficient food for *one* head, will abundantly maintain *four* when left in the stable. 2. Soiling affords at least double the quantity of manure from the same number of cattle; for the best summer manure is produced in the stable and carried to the fields at the most proper period of its fermentation; whereas, when dropped on the meadow and exposed to the action of the air and sun, its power is much wasted. 3. Cows which are accustomed to soiling, will yield much more milk when kept in this manner, and fattening cattle will improve much faster in weight. 4. They are less subject to accidents and diseases—they are protected from the flies which torment them in the fields during the warm weather; and they do not suffer from the heat of summer.

Many other advantages are enumerated. Grazing also has its advantages. Experiments, however, render it certain that soiling, under favourable circumstances, is the most profitable. The Hon. JOSIAH QUINCY, of Massachusetts, ascertained in 1820, that seventeen acres of land, under the soiling system,

* Professor VON THAER, of the Royal Farm and College of Agriculture, established by the king of Prussia at Moëgelin, near Frankfort on the Oder.

supported as much stock, and in as good, if not better condition, as had previously required fifty; and Sir JOHN SINCLAIR states, that thirty-three head of cattle were soiled from the 20th of May to the 1st of October, 1815, on seventeen acres and a half, of which fifty were necessary in pasture. The saving of land was consequently thirty-two and a half acres.

In the Farmers' Series of the Library of Knowledge, the *soiling of horses on green food* is favourably noticed; and that they can be supported with great health and vigour, in the yard or stable, with proper management, is conceded—but its "*economy*, however, must depend on the proportion which it bears to the price of dry food, and its convenience to the quantity in which it can be spared for other cattle." The experience of many hundreds of farmers is cited to show, that horses maintained for years in this manner, have neither lost flesh nor strength, although there was no perceptible saving in their work—and that, though placed on dry food during the winter season, they continued in the possession of perfect health.

It is a most excellent plan to give some green food along with the corn and chaff, before the usual period of feeding entirely on dry fodder.* The change from green to dry and again from dry to green, should be (very) gradual. In its commencement, the clover and tares should be cut and mixed in small portions with straw, and a proportionate quantity of grain should be reduced. The green food is then insensibly increased, until the grain is entirely omitted, and the quantity of green food supplied without limitation. It should, however, be cut over-night,† (late in the evening,) and given only in small quantities gradually increased, to guard as much as possible from accidents, which may arise from its succulence, from hooing.‡ When horses are soiled, they never should get much at a time, a practice far too prevalent.

The artificial grasses used for soiling are the same as those described as suitable for dry forage or hay;§ but *tares*, where raised, now take the lead, as the winter sown are generally earlier ready than any of the grasses—with perhaps the exception of rye-grass in some localities—and affords a much heavier crop. Soiling, when reduced to a system, requires a regular succession of green crops; it is therefore advisable that winter and summer tares (whenever they prove a certain crop) should be sown at different periods, so as to afford a constant supply, both before the clover comes in and after the first crop is cut off. Lucern is one of the most valuable plants for soil-

* No animal should be fed entirely on dry fodder—it is a bad practice.

† Grass for neat cattle should be cut in the morning—is much more relished and the fattening greatly expedited, if the grasses are cut fresh, frequently through the day. Cattle are disgusted with grass which has been lying too long before them, in the sewers or cribs, or if left in the field until withered or heated, which speedily takes place.

‡ Hooing may be guarded against, with care. The disease is produced by the *quality*, and not the *quantity* of food, but it is of course rendered much more dangerous by an increased quantity.

§ In some places meadows are mown for this purpose.

ing. A well authenticated paper, in the Communications to the (English) Board of Agriculture states, that in one year twenty-three horses have been kept twenty weeks; and in the next, twenty-eight horses during eighteen weeks, upon eleven acres of lucern alone, which gives an average of three roods per horse in nineteen weeks.*

In Holland and Flanders where the feeding of cattle is supposed to be much better understood than in most countries, the summer soiling of farm-horses is limited to half an acre of meadow grass, cut and carried to the stable, from the middle of May to the middle of June, from which time to the end of August one-sixth of an acre of clover is added, with two pounds of beans daily; and from thence to November, when the winter feeding commences, the clover is replaced by an equal quantity of carrots. From the number of horses stated, in this instance, to be kept in proportion to the tillage—eleven to one hundred and fifty acres of alluvial soil—their labour can, however, be only light, though a pair is said to draw a ton and a half of manure in the field, and three tons upon the road.†

After viewing all inconveniences, a great variety of circumstances concur to prove most satisfactorily, that the practice of *soiling* or feeding cattle during the summer season 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, such as the *sugar-beet*, ruta-baga, carrots, &c. will, in general, be found highly economical.‡

III. GRAZING OR PASTURING STOCK.

In this country—where very extensive natural pastures abound, and the price of new land of the highest grade of fertility is much less than the annual rent per acre of land in England—the system of grazing was early introduced, and generally prevails at the present day. The sub-divisions of land that is kept exclusively for grazing should depend as well upon its fertility, as upon the number of different kinds of animals that are to be kept upon it. The excellence of pastures depends greatly both upon their position and upon the different species of animals for whose support they are designed.

Uplands, for instance, which are elevated, open, and dry,

* Vol. vii., article 25, Part I.

† Radcliff's Report of the Agriculture of East and West Flanders, p. 216. Another farm, of two hundred acres, mentioned in the same Report, is cultivated by eight horses, each of which get daily, in winter, fifteen pounds of hay, ten pounds of straw, and eight pounds of oats—and, *after* every feed, a bucket of water, *richly whitened with rye or oat-meal.* In summer, clover is substituted for hay, but the other feeding remains the same, and the *white water* is *never* omitted.—p. 54.

‡ Complete Grazier, p. 78.

are the best adapted for the feeding of sheep—while heavy stock is fed with more advantage upon ground which is lower in point of situation, as well as better enclosed. The soil of uplands—particularly if it be of a chalky nature—bears a short though a sweet bite of grass, which is so favourable to the pasturage of the smaller breeds of sheep, that although it will support but a scanty stock, it yet produces the finest species of mutton.* Pastures of this description secure sheep from the rot, and in a great degree preserves them from the attacks of flies, from which they often suffer severely.

But by far the greatest portion of the lands of this country have never been cultivated—where forests do not abound with a close undergrowth of brush, these lands generally produce, without cultivation, the herbage plants peculiar to them. Immense tracts of mountain and hilly pastures, and unimproved low lands are yet met with; a portion of these lands in their present state are unsuited to cultivation; yet they are susceptible of vast improvement, especially the latter class, by freeing them from stagnant water, which always exerts a most pernicious influence on the soil and its produce. This is, generally, easily effected to a desirable extent, by affording an outlet to the water in channels, cut in the most convenient places. This should never be omitted where the land is of sufficient value to pay the expense—which, under careful management, is not heavy—and it is rare, indeed, where land is naturally of sufficient fertility to produce the grasses at all, that the expense of giving an outlet to the surface water will not be repaid by the increased value of the herbage plants produced.

Professor Low recommends a system of draining which has been practiced to a very great extent in some of the mountain districts of Scotland, which is by means of narrow drains, about a foot in depth, made by the spade alone, carried along hollows, whenever the water is likely to be intercepted, by which means it is directed from its usual or natural course. He states that very important improvements have, by this process, been effected at little cost, and that the tendency to rot, one of the most fatal disorders to which sheep on wet lands are liable, is thereby lessened or removed.

Mr. Lorain recommends enclosing or the laying out of natural pastures into fields of a suitable size, as a great means of improvement in elevated countries. Shelter is afforded to the stock, and the animals feed without interruption; as a matter of ornament and profit, useful trees should be planted at intervals on all pasture or grazing lands—for which purpose

* British Husbandry, vol. i. p. 478.

we recommend the locust and the sugar-maple; they will answer for both profit and ornament.

The feeding and fattening of cattle, whether for labour or for sale, is the most important of the whole economy of the grass farm. It therefore follows, that 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.* Those beasts only should be selected which evince the most *thriving disposition to fatten* with the *least consumption of food,* and depasture them upon such lands as are best calculated for the respective breeds.* Cattle ought not to be taken from rich to inferior soils—it is desirable to choose them from lands of nearly the same quality as those intended for their reception. It would be well for graziers to choose their purchased stock from an inferior soil. It is also proper in all situations not fully supplied with wholesome water, to avoid selecting cattle from those districts where it abounds in a state of purity. The neglect of this matter has proved highly detrimental to the interests of many graziers.

Mr. Lawrence says that a heifer or cow will make beef earlier than a steer; and that an old cow, or an old sheep, will not fatten near so well with hay as with grass.

The *practice* of *grazing* necessarily differs according to the nature of the land. In stocking lands, as the proportion of beasts must depend upon the fertility of the soil, it will generally be found that local custom, which is generally the result of experience, will afford the surest guide. Instances are recorded in English works, of fifteen large bullocks and one hundred and fifteen sheep having been fattened on fifteen acres. The sub-divisions of land, kept for the sole purpose of pasturing, should depend as well upon its fertility, as upon the number of different kinds of cattle to be fed upon it.† To render the grazing of cattle profitable, it is necessary to change them from one pasture to another, beginning with the most inferior grass, and gradually removing them into the best. By this expedient, as cattle delight in variety, they will cull the uppermost or choicest parts of the grass, and by filling themselves quickly, as well as by lying down much, they will rapidly advance towards a proper state of fatness. By this process, enclosures are rendered necessary, but great difference exists as to the most suitable size.

John Nicholson, Esq., in his valuable work, the Farmers' Assistant, says, "If a farmer has but three cows, and has three

* Complete Grazier, 6th ed. p. 72. † Low's Elements.

acres of the best pasture land, he ought to divide this into at least two parts, so that the one can be growing while the other is feeding. Again, if he keeps twenty cows, and has twenty acres of the best pasture, he will find his reward in having it divided into four parts, and pasturing each enclosure three or four days alternately. In this way pasture land will keep at least one-fourth more of cattle, and will keep them better, than if the pasture were in one field. Not only a change of pasture is beneficial, but a change of different kinds of cattle, in the same pasture, should be attended to. Thus let the milch cows take the first cropping of each field in rotation, then the horses and oxen, and the sheep next. In this way the last feeder will eat much grass that has been rejected by the former."

Pastures should never be *overstocked;* that is, there should always be a sufficient quantity of food for the animals. It is also desirable that the large and strong cattle be separated from the weaker ones, as it frequently happens that where they are indiscriminately mingled together, the more powerful beasts will master the others, driving them from place to place, and trampling upon and destroying more food than they can eat. To prevent these inconveniences, and also to stock the land to the greatest advantage, the Complete Grazier recommends the following method of feeding and fattening cattle.

Suppose there are four enclosures, one 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 enclosures in the following succession: 1. Free from stock, till ready for the best cattle. 2. For the reception of the best cattle, till sent to No. 1. 3. For the second best cattle, till sent to No. 2. 4. For the young cattle, till sent to No. 3. Thus the fourth enclosure is kept free from stock till the grass is got up, and it is ready for the prime cattle. To which we will add that the enclosures should be finally gone over by sheep, by which they will be eaten down to a close and even sward, to the great benefit of the after growth.

Fattening cattle will cull the choicest parts of the grass, when this system is adopted, and advance rapidly towards a state of maturity—for they should always have a full bite of short sweet grass; and with such cattle the utmost care must be taken not to overstock the enclosures—an evil of too frequent occurrence. A sub-division of enclosures by hurdles has been recommended. We have already referred to the subject of shelter—shade and pure water are essentially necessary—indeed they are indispensable to the thrift and comfort of the stock. Where there are no trees, rubbing posts should be set up to prevent the cattle making use of the gates and fences for that purpose, by which they frequently are injured.

In the management of land kept in pasture, no manuring is required to maintain its fertility, which will be increased and

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not diminished by the effects of pasturing. Any species of manure, however, will add to the productiveness of land in grass; and when from any peculiar cause, it is thought expedient to manure land in grass, the best kind of manure is usually lime, or composts of earth and lime, marl, &c. These should invariably be applied as a top dressing, that is, simply spread upon the surface, where vegetation has become inert at the fall of the year, or before it has become vigorous in the spring.

IV. WINTER STALL FEEDING.

This practice is very nearly allied to that of summer soiling —it is in fact one and the same—the difference being produced by a change of food, rendered necessary by the change of season. Two methods are adopted, they may be either confined to the stalls, or kept in small yards with open sheds attached. Great numbers of cattle fed and fattened in these open sheds are invariably termed stall fed. It has been found by some farmers more profitable to confine cattle, designed for the shambles, in stalls—but still much diversity of opinion prevails.

Under the yard system of feeding the animals have more freedom than when fed in close stalls, and that moderate exercise, which, without impeding their fattening, tends to keep them in health. They receive the benefit of the sun and air, and have always the shelter shed to retire to; and their food, being in the open air, is kept always fresh. The management of the cattle is easy. The yards should be small. Each shed with its yard should be of a size to contain easily two oxen, or if it be made of a size to hold four, there should be a division between each pair, so that more than two shall not be together. In the open yard, and close to the wall—which should be well built—the troughs for holding the provender are to be fixed.

In some instances, where the animals to be fattened or kept through the winter are confined to the house, they are merely tied by the neck to upright posts, and fed from a trough or manger. But the more general practice is, for each animal to have its own stall; and there are various modes of fastening the beasts; those generally preferred, are represented in the annexed diagrams. For a full account of the various modes of fastening, the reader is referred to the Farmer's Cabinet, vol. iii. page 354. When the cattle are for the first time to be fixed to their stakes, or the fastenings in the stalls, great care is needed to induce them to go forward. Gentle means only must be employed. The chain or strap should be so shortened as to prevent their turning round. As they sometimes injure themselves by struggling, it is needful that they be carefully watched for a season. The roots are to be placed in a low manger before them. It must always be remembered that one of the essentials of success is, that the cattle must at all times be well littered.

Early in the morning the first operation to be performed is, to remove the dung from behind the cattle, and to place the roots in the stall, after having been previously prepared. While the cattle are feeding, the dung is to be wheeled out of the house and deposited in the yard or dung pit. When the roots are eaten, good hay, well cured, should be placed before them, and they being now littered, will soon lie down and chew the cud.

At mid-day they are again to be fed as before; and again before sunset; a sufficient quantity of provender being placed before them after each meal; and, finally, whenever it can be done with perfect safety, the farmer or keeper, before retiring for the night, should examine them to see that all is right, stir their litter, and if necessary place more provender before them. Under this system the cattle will be fully fed, and induced, during the intervals of feeding, to lie down. Early in the morning the same process re-commences—and the utmost regularity is to be observed in these operations, for the animals know the precise time of feeding, and become restless when it is not observed. Careful feeders currycomb their cattle, and in all cases are exceedingly particular that the skin is kept free from vermin or other impurity.—Low.

The first point, therefore, to be observed, is the *comfort of accommodation*—which embraces security, perfect shelter, a sufficient degree of warmth, and an abundant supply of dry litter. A moderate degree of healthful ventilation is recommended. The next point is *strict regularity in the administration of food.* The periods may be regulated as the feeder thinks proper, both as to time and quantity, but when once adopted, must not be deviated from, for reasons previously assigned. Nothing is found more conducive to the fattening of animals than perfect quietude—every means therefore should be used to induce rest, ease, and contentment. The periods of feeding recommended above is sufficient, as digestion is interrupted by too frequent feeding. The quantity should be moderate—that is, the animal should not be cloyed—he should have as much as he can eat with a relish, but no more. The last point to be observed is *thorough cleanliness.* The houses should be opened early, well ventilated, and cleansed by pail and broom of every impurity. When the animals are satisfied, the surplus must be immediately removed, the cribs and mangers swept out, and when necessary well washed. *Water must in all cases be given without limitation,* clean and fresh, and the watering troughs daily well washed out and cleansed.

Assuming that six hundred bushels of the ruta-baga will grow upon an acre—which we have shown is much below the average where good management is present—and that six hundred bushels of the roots will go as far in making beef as three acres in corn, with the further advantage, that the latter will cost three times as much labour in its culture as the former. The mangel-wurtzel, the carrot, and parsnep, may all be raised in field culture, at about the same expense per acre as corn—and they will give as great a yield, and afford as much nutriment as the ruta-baga. The potato, whose culture we are all acquainted with, should be made to yield (average) three hundred bushels; and these afford a far more profitable feed than grain. A bullock will consume from one hundred and twenty to two hundred and forty pounds of ruta-baga per day—but, if full fed with this, or other roots, they will consume but little hay, and have little or no occasion for water.—*Opinion of Judge Buel.* We find no notice here of the sugar-beet, as it was just introduced, and its great and peculiar merit and advantages but little known. It is one of the most prolific and nutritious roots. The average yield of the sugar-beet and ruta-baga, on good soil, with good culture and a friendly season, will reach one thousand bushels per acre—two thousand and upwards of the former, and fifteen hundred of the latter, have been raised to the acre; and it has been ascertained, that four bushels of either will go as far as one bushel of grain in the keep of cattle.

The practice of stall-feeding, properly speaking, is more common; and in the management of this branch of feeding, no common share of attention is required, for the manner in which it is conducted may effect the thriving of the beasts nearly as much as the quantity and the quality of their food—and the farmer who thinks he has only to throw them plenty, without regarding the mode of supplying it, will find himself deceived in the expectation of improvement.* The late George Culley—one of the most eminent cattle breeders—was of opinion that a plain, coarse, ugly animal, may pay more than a fine well made one, for the reason that the coarse one is bought at a much less price in proportion; and it cannot be too earnestly pressed upon the feeder, the propriety of selecting those cattle for the stall—or indeed for any farm purpose—which have the finest points in their form; for these will not only carry beef of the finest quality, but will consume less food in proportion—particularly as they attain age and fatness—and thereby, generally, realize the greatest profit on their fattening.

The relative *proportion of food consumed by fattening beasts,* varies according to the size and quality of the animals, and the nutriment afforded by the vegetables with which they are supplied. It is not the quantity of food which the animal

* British Husbandry, vol. ii. No. 12.

consumes that fattens it, but the quality. Formerly nothing but hay was used in fattening animals, but this was found to be a tedious and expensive process, although of all vegetable substances nothing can be better than *good hay* for improving the flesh of fattening cattle. Notwithstanding, beef cannot be made to profit on hay alone. Of late years—that is, since the practice has become general in England and on the continent—oil and rape-cake has been generally used, and almost every species of *field root*—and likewise, what cannot be highly recommended, if indeed it can be recommended at all—the grain and wash from distilleries.*

Potatoes, mangel-wurtzel, carrots, parsneps, cabbages and turnips of every kind, have been brought into general use, and found highly valuable. But these roots must give place—though not entirely—to the very superior claims of the ruta-baga and the sugar-beet, the latter of very recent introduction among us. They are adapted, admirably, to our soil and climate—yield immense crops with proper cultivation—are hardy—exceedingly nutritious—and eaten with the greatest avidity by all animals, who thrive astonishingly upon the sugar-beet especially. For further particulars respecting the different roots here named, the reader is referred to their respective heads. A fair allowance of good, sound, nutritive hay should not be omitted, with occasionally a mess of grain properly prepared. Roots, be it remembered, are important auxiliaries, not substitutes, in the economy of fodder.

The cooking of all kinds of grain roots, &c. for every variety of stock, is coming into very general practice, especially in this country—for this purpose various machines have been constructed—many of them on very simple principles, for carrying on the process of steaming with the greatest economy and least consumption of time. In our chapter on farm implements, we have given cuts of several, with explanations annexed. The practice has been highly commended in all our agricultural periodicals. The Farmer's Assistant says,

* The practice of feeding animals on the refuse of distilleries, is very extensively practiced both in this country and in England. This wash or refuse is generally purchased by persons residing in the neighbourhood of our large cities and towns, who supply them with milk, and, in such cases, constitute almost entirely the sole food of milch cows. This practice is most pernicious; and the reason for this assertion must be apparent to every intelligent man who will investigate the subject. That cattle will fatten on the refuse of distilleries is universally admitted. We find it stated in the second volume of British Husbandry that eight hundred and ten oxen were fattened on the refuse of twenty-five thousand seven hundred and fifty quarters of barley, and in twenty weeks an increase of flesh was acquired, averaging to each of the cattle, thirty-five stone of eight pounds each—which, deducting five stone as the value of the hay they consumed, leaves one hundred and eighty-four thousand four hundred pounds of beef—a most astonishing result.

that "grain, roots, vegetable matter of every kind, even grass itself, is found much improved as a food for cattle, when it has been fully subjected to the operations of steaming. William Penn Kinzer, Esq., of Lancaster county, Pa., prepares his grain by "*boiling* in proportion of one bushel of grain to forty gallons water. For fattening, I have found one-third of corn to two-thirds of bran sufficient; but if the process is to be hastened, the proportion is reversed. * * * By this method, cattle and hogs are fattened in half the time that is required on raw grain, with an economy of grain infinitely great." Milch cows with the same feed, yielded a surprising increase of milk and cream. Steaming, says Mr. K., I confine entirely to every variety of roots.

Numerous experiments have been made to ascertain the advantages of preparing the food of cattle either by steaming or boiling, over the old method of feeding raw. The result has been almost invariably in favour of the practice; but the opinion long entertained, and warmly inculcated, that by this process the nutritive properties of the food thus prepared, is increased or augmented, is entirely erroneous. The food, when cooked, is unquestionably more readily digested; and by this means it is, that the animals receive more nourishment from a given quantity cooked or steamed food, than the same amount if fed raw. Steamed food is never of the same advantage to ruminating animals, as to those with single stomachs, as the horse and the hog. Experiments upon equal quantities of food cannot, indeed, be considered as decisive upon the feeding properties of cattle, as they cannot all be supposed to have appetites alike, or be in a disposition most favourable to the taking on of fat.

Recent experiments made in consequence of premiums offered by the Highland Agricultural Society of Scotland, have had a tendency to throw much doubt on the practice. The animals selected were fed on ruta-baga, potatoes, and beans. When put up on the 20th of February, the difference in the total live weight was but half a pound, and when slaughtered on the 20th of May, the total difference in favour of the three animals fed on steamed food, over the three fed on raw, was but four pounds; while on the other hand the three heifers fed on steamed food had consumed about one-fifth more food than the others. In this consists the loss, with the time and expense of steaming. This experiment is not conclusive, and is wholly overthrown by the every-day experience of many of our practical and intelligent farmers.

The propriety and profit of stall feeding with grain, will, in a great measure, depend upon the price of the latter. The practice of feeding grain to cattle, unless under peculiar circumstances, cannot be recommended, and more especially while roots adapted to the purpose, such as the sugar-beet, are so readily raised in great abundance. A gentleman residing in Chester county, J. J. MILLIGAN, made an experiment on this subject. In his account* he says, I ascertained that two yokes of oxen would sell off the grass for two hundred dollars. This I considered a fair price; but being disposed to stall feed for more profit, I had them placed in the stalls on the first of November, 1836, and sold them the middle of February following, when beef was selling "high" in the market, at nine cents per pound, with the allowance of sixty pounds to the one hundred for beef, which was equal to five dollars and thirty-three cents per hundred on the live weight. My account then is as follows:

Dr.		Cr.	
4 cattle worth	$200 00	By 4 cattle sold	$300 00
$5\frac{1}{2}$ tons hay, at $12	66 00	Manure, exclusive of littering	15 00
102 bushels of corn at 90 cts.	91 80		
24 bushels of oats at 45 cts.	12 60		315 00
		Loss	61 64
	370 40		
Interest on the above for $3\frac{1}{2}$ mo.	6 24		$376 64
	$376 64		

The experimenter has made here no calculation as to the time occupied in overlooking these animals, neither has he stated *how* the grain was fed, whether in a *raw* and *whole* or *cooked* state; we apprehend the former, though we greatly regret the omission in the statement. Mr. MILLIGAN, has certainly placed the agricultural community under great obligations, for shewing wherein he failed. In this he has risen superior to prejudice. It is as necessary for us to know wherein experiments have proved unfavourable as otherwise. We subjoin another experiment—see Farmer's Cabinet, vol. ii. p. 293—by ISAAC W. ROBERTS, of Lower Merion, Montgomery county, addressed to the Philadelphia Society for Promoting Agriculture. He says—

Believing that the cause of agriculture may be promoted by practical observations and statistical facts, and that theories and principles should be based on these, I beg leave to communicate a statement regarding four bullocks which I have had the pleasure of bringing to a high degree of perfection. One of these steers was admitted to be one of the fattest ever exhibited in the Philadelphia market, and the others very little inferior to him. By the annexed statement it will be seen that the result, of between two and three years stall feeding, has been to pay me full prices for the grain, beets and hay consumed, and allow the manure for straw and labour, a result that I think would satisfy any reasonable farmer or grazier. At the same time to succeed well with feeding large cattle, it is necessary that they should be kind and good feeders. They should also be attended with especial care. Without these pre-requisites the farmer had better sell his grain than stall feed cattle.

* Farmer's Cabinet, vol. ii. p. 227.

Statement to 1*st of May,* 1836.

November 15, 1835, bought two steers, estimated at 1750 lbs. dead weight—cost - - - - - - - -	$110 00
Commenced stall feeding them on the 1st of December and continued 150 days at 27 quarts per day, or 126 bushels at 70 cents,	88 20
They consumed two tons of hay at $16, - - - - -	32 00
The grain consisted of equal parts of corn and oats, ground; or corn and "mill stuff," or wheat bran. On the 1st of May, 1836,	230 20
turned them on grass with a pair of oxen, estimated weight 1850 lbs. and valued at - - - - - - - -	$150 00

Statement from 1*st of May,* 1836.

Cost as above of the four cattle - - - - - -	$380 20
Pasture during the season for the four - - - - -	80 00
Commenced feeding grain on the 1st of October, twice a day, till the 1st of December, and then three times per day till the 1st of May, 1837, equal to 190 days full feeding of 2 bushels per day, or 380 bushels as above, at 70 cents, - - - - - -	266 00
100 bushels mangel-wurtzel beets at 25 cents, - - -	25 00
5 tons of hay at $16, - - - - - - - -	80 00
	$831 00
Grass during the summer of 1837 - - - - - -	80 00
Commenced feeding grain on the 1st of September, 1837, twice per day till the 1st of December, and then three times per day till the 19th of February, say 140 days full feeding, or 280 bushels at 70 cents, - - - - - - - - -	196 00
100 bushels mangel-wurtzel, at 25 cents, - - - - -	25 00
3½ tons of hay, at $12, - - - - - - -	42 00
	$1174 20

On the 19th of February, 1838, sold them to the victuallers for 1200 dollars. In the spring of 1836 the two steers would have sold for 240 dollars, and in the spring of 1837 I estimated them at current market price as worth 750, and if then sold there would have been an apparent loss; but it should be remarked in explanation, that the stall feeding extends to the 1st of May, whereas the season for selling is the middle of February to the 1st of March, when their cost was about what I estimated them as worth to the butcher.

RECAPITULATION.

First cost of the four cattle, - - - - - - -	$260 00
Pasture during two seasons, - - - - - -	160 00
Grain fed to them 786 bushels at 70 cents, - - -	550 20
Mangel-wurtzel 200 bushels at 25 cents, - - -	50 00
7 tons of hay, at $16, - - - - - - -	112 00
3½ tons of hay, at $12, - - - - - - -	42 00
	$1174 20

And being sold for 1200 dollars, gives, as before stated, the manure for straw and labour, leaving a balance of 26 dollars, and paying me a liberal price for the produce of the farm; about two-thirds of the grain consisted of equal measure of corn and oats, and one-third was corn and mill-feed.

By the foregoing statement it appears that the average increase in value of each animal was about 100 dollars per annum.

STATEMENT OF WEIGHT AND GIRTH.

	Live weight.	*Dead weight.*	*Girth.*
STEERS—*No.* 1.	2422 lbs.	1671 lbs.	9 ft. 1 in.
No. 2.	2324 "	1613½ "	8 " 9½ "
OXEN—*No.* 3.	2555 "	1691 "	9 " 2½ "
No. 4.	2261 "	1533½ "	8 " 9 "

XV.—GENERAL ECONOMY OF THE FARM.

I. ARTIFICIAL DIVISIONS OF THE FARM.

Fences in rural economy comprehend in general, every sort of enclosure that is employed for shelter, or designed for the protection of the lands thus enclosed from the intrusion of cattle; they are of different kinds, depending on the various circumstances of soil, situation, the kinds of materials at hand most suitable for the purpose, and the convenience with which they may be obtained. Where a country is entirely in tillage, it is of less importance that farms be divided by artificial barriers; but wherever live stock is kept, this is essential to the proper keeping of the animals, and to the profitable occupation of the grounds, besides the purpose of retaining and separating animals of different kinds from one another. Every person about to erect a fence, should have special regard to three essential points—durability, economy, and neatness of appearance.

"Poor fences are of incalculable mischief to the farmer." They are frequently the means of disturbing that good neighbourhood which would, in many places, otherwise exist without interruption, if each farmer would attend to having his fences well and substantially made, and kept constantly in good order and repair. Unless fences are made sufficiently high and strong, there can be no safety to the crops—the cattle selecting the weakest points, are apt to break over them, and thereby imbibe vicious habits.

The description of fences and the method of their construction, depends wholly upon the soil, and the various kinds of materials at hand or most readily obtained. There are a variety of kinds of fences or enclosures used; the log fence, the post and rail, the worm or zigzag, and the stone, which, when the materials are readily obtained, and the fence is properly built, is by all means the most durable, economical, and secure—the ditch, the paling, and the live hedge. But in whatever manner and of whatever materials they may be constructed, they should be frequently surveyed with a critical eye, and all defects rectified without the least delay.

The growing and alarming scarcity of timber in the United States, renders the enclosure of farms a very expensive item. It therefore is the interest of the farmer to preserve his fences, now in good condition, as long as possible in that state; and, in the construction of new ones, to exercise economy, by having them erected, of whatever materials, in a most substantial and durable manner. The saving of a few dollars in the outlay, is only apparent—not real. We must not be understood as advocating extravagance in this or any other department of rural affairs; but we do maintain, that what is worth doing at all, is worth doing well, and that therefore, in the erection of fences, the best and most durable materials should be selected; and the whole put together in a solid, substantial, and workmanlike manner.

Almost every individual has an idea that he fully understands the process of *making rail fence*, which is a simple process, and yet perhaps not more than one in twenty has any established system or fixed rules by which their operations are to be controlled in this essential and important department of farm labour. A writer in the Genesee Farmer, says that no sight is to him more pleasing than a well made rail fence. His system of construction is briefly as follows:—

"To ascertain when a sufficient number of rails have been drawn for a given distance of fence—1. If the fence is to be seven rails high, and twelve feet long, place them in piles of ten each, in a continuous line, touching each other. 2. Place in range, stakes or poles at intervals to designate the line; prepare a pole seven or eight feet long, well sharpened at one end; (the end ought by all means to be pointed with iron;) at about eighteen inches from the pointed end, fasten a rod at right angles with the pole, and extending thence from three feet, two, four, or six inches, according as the fence is exposed to winds. Put down this pole in a range with the poles designating the line, and the end of the rod will show the place for the corner. Place then, for a foundation, a good sized flat stone, and you are ready to commence operations. 3. The bottom rail should be straight—place the largest end forward on the stone, and the other end crossing the preceding rail at the end of the rod of the ranging pole, so that the corners on each side be in exact line. 4. Let the five following rails be placed the smallest end forward, and notched, if necessary, to make them lie steadily. 5. Let the top rail be heavy and well notched, the largest end placed forward, which completes the work, leaving your fence level and of equal height throughout."

Various substitutes have been proposed for the common post and rail fence, the most prominent of which will be hereafter noticed. Notwithstanding the great scarcity of timber in the Atlantic states, which is a matter of great solicitude, in view of obtaining in future a supply of timber suitable for fencing alone, the system of post and rail fences, with proper management on the part of farmers, may be easily and advantageously perpetuated. James Worth, Esq., of Sharon, near Newton, Bucks county, Penna., a gentleman who has devoted much of his time, talents, and fortune in promoting the general interests of agriculture, after a minute and careful examination of the claims of all the varieties of fences used and recommended throughout the country, came to the conclusion that the post and rail, and the stone fence, (wherever the materials for its construction abound,) were best adapted to the country and the interests of the farmer. Having determined in favour of the post with fine rails, for general purposes, he says:—

"I turn my attention to that particular kind, and will proceed to provide for its future supply. Plant an acre of ground with chestnut and locust seeds, five-sixths of it with chestnut for rails, and one-sixth with locust for posts. Four trees will grow on a perch, making six hundred and forty on the acre; I suppose that forty of them will fail, leaving six hundred trees, each of which will produce in thirty years, and every twenty to twenty-five years afterwards, twenty rails or posts, which will yield at each cutting, twelve thousand posts and rails, or two thousand panels. Then say the acre of land is worth eighty dollars, it will reduce the materials to four cents per panel, which, with making and putting up, will not exceed twenty-five cents. In point of durability, I am persuaded that it will be exceeded by none except the stone, and it will have an advantage over that by being moveable when necessary."

Mr. Worth's reasons for preferring the locust post and chestnut rails, are thus stated. It occupies less ground than any other—the borders of the fields are easily kept clean—the great durability of the materials—the ease with which they may be obtained by every farmer—as the trees flourish in a tolerably good soil in every part of our country. One acre thus appropriated is sufficient for a farm of five hundred acres; and consequently, a quarter of an acre will be abundant for a farm of one hundred acres. To what better or more profitable purpose can so small a portion of the best land on the farm be appropriated. The only objection is that there is no immediate availability; that from twenty-five to thirty years must elapse before the trees can be made into rails. This objection is as unsatisfactory as it is unsound. There are thousands, who, if they were *now* to appropriate sufficient ground, according to the size of their farms, and plant it as proposed, may, with the blessing of Providence, live to enjoy its advantages for years. What! not plant an orchard or a grove of locust, or a cluster of maple, because we shall not live to enjoy the benefits thereof! Such statements should never find an abiding place in the bosom of an American farmer; for every intelligent man knows full well, that every measure of this kind, tends not merely to adorn and beautify his plantation, but also greatly to increase its prospective value. Every farmer should see without delay to having his grounds suitably stocked with trees.

It is estimated that a fence of locust posts and chestnut rails, with very little repair, will last for at least sixty years; so that the necessities of the farm would require only the third cutting of the timber—the two intermediate cuttings, yielding thirty thousand posts and rails, are ready for a market, which would be readily found, and which at the low rate of five dollars a hundred, would give the owner of the farm an average gain of twenty dollars for each and every year the acre of land was thus appropriated; in addition to furnishing all necessary fencing for the farm. This, dating from the commencement, is a handsome profit.

Cedar post and rail fence. JAMES GARNETT, Esq., a name familiar to the reading farmer, says—"I can affirm, from my own experience, that a cedar post and rail fence, without any ditch, the materials for which grow spontaneously over a large portion of Virginia, and will grow by planting almost any where in the United States, will last, without the slightest repair, from thirteen to fourteen years; and may be made to last six or eight years longer, by a few occasional supplies of rails and posts. I also know, from my own experience, that either cedar, chestnut, or locust, the last of which is more durable than either, will, in fourteen years, grow sufficiently large to make the fence anew, if planted by the side of it—one or two to each panel."—*From Mr. Garnett's Address before the Fredericksburg, Virginia, Agricultural Society.*

A great diversity of opinion has prevailed among many persons as to the *best time for cutting timber*, so as to insure its greatest durability. Some recommend the summer season, some the fall, others the winter, when the sap has generally descended; while others again who have entered into a careful investigation of the subject, have come to the conclusion that the most suitable period for felling timber is in the spring while the sap flows freely. This will, no doubt, be considered as rank heresy by many of those who cannot regard with complacency what they deem innovations on their old and favourite systems. But this opinion is gaining ground, from the simple circumstance, that it is well sustained by incontrovertible facts.

An old and observing friend, Captain COOPER, of the navy, furnished for publication some time since, in an agricultural work, a variety of facts, touching this important matter; from which it clearly appears that spring, that is, while the sap is flowing freely, is the best time for cutting timber.* The late JOSEPH COOPER, Esq., warmly advocated this system. In the

* Farmer's Cabinet, vol. iii. p. 29, one fact is given. J. C., (JOSEPH COOPER, Esq.,) informed me that a detachment of British troops crossed from Philadelphia the 1st day of May, in 1777, and on the 2nd commenced cutting down his woods for the supply of the army, and at the same time to burn up his fencing, which they completely accomplished. "But," said he, "they taught me the proper time to cut timber to make it last. After they marched off, I found many trees that were not cut into cord wood; those I split into rails, believing, at the same time, they would soon decay, from their being cut in the spring—but I have been agreeably disappointed—most of them are as sound now as when made into fence." This he related five-and-twenty or thirty years after the peace of '83.

same paper, page 4, is a communication recommending the month of August, within one day of the time when the moon is full, as the best period for cutting all kinds of *oak*. But it is urged, in order to *guard* it from decay, to immerse the wood immediately after it is cut and split to the dimensions required, in lime and water, in which it is to remain a year, affording time for the particles of lime to penetrate the pores of the wood. This lime water is to be frequently agitated. This process requires a vat, which may be sunk in the ground at little expense. The water and lime should be of the consistence of white wash. If the durability of the timber is promoted by this process, it is evidently owing to the antiseptic quality of the lime water with which it is saturated, and *not* to the mere circumstance of cutting the timber in August.

The Editor of the Genesee Farmer, and a host of his correspondents, recommend cutting timber in the winter, as its durability depends upon its being cut when free from sap. JOSHUA HOWARD says, that from twenty years experience in the preservation of timber, the best time to cut it to ensure durability, is when the tree is in its greatest vigour, which, in the latitude of his residence, Dearbornville, N. Y., is about the middle of June. He cites a case in which a man was convinced against his will. A farmer in North Carolina wishing to fence a certain lot, went to work according to the old theory, and cut his rail timber during the full of the moon in February. When he came in May to put up his fence, he was deficient about forty panels; he went into the woods, cut the requisite quantity, and put it up as the only alternative. Ten or twelve years afterward on examining the fence, he was exceedingly surprised to find that the rails cut and split in May, were infinitely more sound than those cut and prepared in February. There are thousands of similar cases.

A great variety of plans have been proposed for the preservation of timber. The late SAMUEL PRESTON, of Stockport, Pa., was satisfied from experience, that posts set with the top part in the ground, will last from three to four times as long as when they are set with the butt ends down. DANIEL LONGSTRETH says that penstocks and other timbers exposed to wet or dampness near the water-wheel, are placed by many millwrights with the top end downwards, as they are found to be more durable than when placed in a different position. *Charring posts* has been strongly recommended and extensively practiced, without, however, answering fully the expectation of its advocates. *Wood tar* has been recorded as a preservative of timber. A correspondent of the Farmer's (Va.) Register, cites several very interesting cases, which go to prove

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that posts cut and put in the ground *green* will remain perfectly sound many years after well seasoned posts, in the same line of fence, in the same soil, and put in at the same time, have entirely decayed. We need, however, further experiments on all these points.

II. STONE FENCES.

Where suitable materials abound, or may be easily obtained, stone fences, properly constructed, are to be recommended over all others. They are perfect from the day of their erection, are easily kept in repair, and should any portion fall, the materials remain on the spot. The saving of land is great, as the plough might and ought to pass close to the wall. The expense of erection must vary according to circumstances. I have had, says a correspondent of the Farmer's Cabinet, the work done for two dollars a perch, of twenty-two feet in length by six feet in height, quarrying the stone and carrying included, while in some situations I have given three times that sum for the same work.* Although it may not be practicable to enclose the whole farm at first, still, if the materials are at hand, they may be carried at leisure times, or whenever opportunity offers, to the line of the intended fence, there deposited, to be put up when sufficient for the erection of but a single perch at a time. The work by this means would be accomplished sooner than could be imagined—*once and forever.* A stone fence should never be erected on the surface, whatever may be its character or situation; it should have a good and dry foundation, sunk entirely beneath the influence of frost.

Professor Low gives the following description of the method adopted in Scotland for erecting stone fences. He recommends building on the surface or greensward if it is fine. This practice may answer for Scotland and England, but it will not suit this country, especially the middle and northern states.

The stone wall may either be formed of stones built without cement, or it may be built with mortar like common masonry.—But the last of these methods is rarely practised with the common fences of a farm.—The cementing of the stones with mortar, adds, indeed, to the durability of the wall, but then the expense is generally too great in common cases. The wall, therefore, for the ordinary purposes of the farm, may generally be built of stones alone, though sometimes with a little mortar merely for cementing the coping, and occasionally for pinning or closing the interstices of the outside.

The materials for building the dry stone wall, as this kind of wall is termed, may be sand-stone, whin-stone, or any other stone of sufficient durability.

* Four and a half to five and a half feet, with a good coping, will be found sufficiently high.

Loose stones taken from the surface, termed land-stones, answer sufficiently well, if they be of proper size, and not too much rounded; but in the latter case, they present too smooth a surface, and cannot be kept in their places without mortar.

The implements to be used in building the dry-stone wall are, a mason's hammer, a spade or shovel for clearing the ground for a foundation, a pick or mattock, and a frame of two upright posts fixed together, so as to correspond with a vertical section of a portion of the wall, (Fig. 40.)

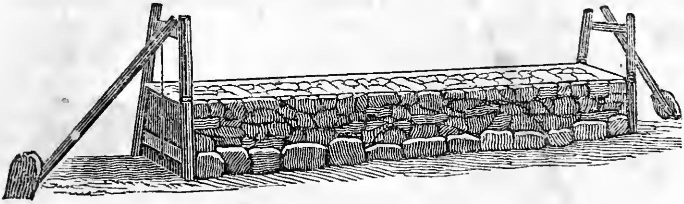


Fig. 40.

The line of the intended fence being fixed upon and marked on the ground, the stones for building should be brought forward, and laid down on both sides, if possible, of the line of fence, but, if not, on one side. Pins being fixed in the centre of the space to be occupied by the wall, the workman proceeds thus:—He carries his wooden frame to some distance along the line to be built upon; he sets it perpendicular, which he is enabled to do by means of a plumb-line attached to it, and he fixes it in this position in a simple manner as shown in the figure. He then fixes another similar frame at the place where the wall is to commence; he stretches two cords between these two frames on the outside, and as these cords correspond with the outside of the wall at a given height, he has a guide for building it of the required dimensions. After having built one portion, he uses only one frame, the wall itself serving afterwards the part of a frame: for the cords being fixed to both sides of the wall, and then attached to the frame which is placed in advance, the workman has, as before, a guide by which he proceeds in building.

The foundation of the wall should be laid on firm ground, and when there is not greensward to build upon, the loose earth should be taken out by the spade, until a solid foundation is arrived at. In building, the largest and flattest stones should be used for the foundation; and it is very desirable, if the materials used will allow, to place stones at intervals, of sufficient size to lie across the breadth of the wall, so as to bind the wall together and render it more secure. (Fig. 41.) Different kinds of coping may be placed upon the wall, to defend it; one of these consists merely of turf, two sods being laid upon the wall, with the earthy sides placed towards each other. Another species of coping consists of large stones, which being closely built and wedged together, are cemented by mortar. This is a complete and durable species of coping, but when it is used, a row of flat stones should be laid on the top of the wall immediately beneath the coping and made to project a little on each side of it. (Fig. 42.)

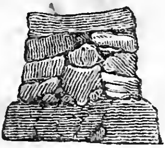


Fig. 41.

A wall sufficient for the purpose of the farm may be 32 inches wide at bottom, and including the coping 4½ feet high, and two good cart loads of stones will suffice for building a yard.

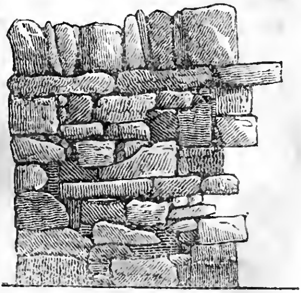


Fig. 42.

The following is said to be the best system as yet adopted in the state of New York for the erection of stone fences; it is highly recommended, having received the sanction of many eminent farmers, and among them the Editor of the Cultivator, from which Journal we extract the account.

Where stones abound upon a farm, and require to be taken off the field to facilitate the tillage, it is no doubt economical to work them into stone fences, and the sooner the better, as by it an incumbrance is removed and a substantial fence erected. The economy of making stone fences in other cases, will depend on the scarcity or price of other materials for dead fences, or the facility of getting stone. These circumstances will vary on almost every farm, and must become matters of individual calculation. But all experience teaches, that when stone walls are to be made, there is economy in the long run in making them well, that is, in making them so that they shall prove an efficient barrier to farm stock, and out last the maker of them. If they are not efficient and durable they become a source of incalculable trouble and expense. The damage to crops and the expense of frequent repairs, to say nothing of their unsightly appearance, will soon overbalance the cost of building them well in the outset. "What you do, do well," is a maxim that will apply with particular force to this branch of farm improvement.

The material necessary for a good wall is flat stones; the requisites to ensure durability are, a substantial foundation, which will give equally to pressure or frosts—a sufficient base to sustain the superstructure—a coping and a good workman: and to render them efficient they should be four and a half or five feet high, either entirely of stone, or crowned with a sufficient wooden structure. If the mass of stone are not flat, or rather, if they are all round, they will not stay long in their place without a broad base and great slope upon the exterior surface. Round stones should be only used in what are denominated half walls, and which are to be crowned with wood. If the foundation gives unequally, the structure of the wall will soon be deranged and part of it will fall. A prudent way is to base it upon the hard part or sub-soil, by clearing off the surface of the earth. Stone walls, unless laid in lime, which by the bye is an excellent practice, particularly about farm buildings where the expense can be afforded, should incline inwards from the base to the coping. The slope should be an inch in a foot; and if the wall is five feet high, and twelve inches broad at top, it should be two feet broad at bottom. The coping, which consists of broad stones extending across the top, tends, by its weight and its bond, to keep the materials in place.

Heavy stones of suitable size should be reserved for this use. But even with good materials, a good foundation, and a broad base, a stone wall will not be permanent, unless the stones are properly placed so as to constitute a bond, and prevent their falling piecemeal. The construction of a wall of stone or brick demands an observance of the same professional rules of structure, whether it be intended for fence or a dwelling. The breaking of joints, both lengthwise and across, which we denominate the bond, constitutes the main strength of the structure. There are three modes of constructing stone fences in common use.—1. Where the material is abundant, and where the whole structure is to be of stone—such should be five feet high, two feet broad at bottom, and one foot at top, which will allow a flare of one inch to the foot on each surface. 2. Where the materials of the fence are to be part stone and part wood, which is sometimes termed half wall fence—in constructing this, posts are first set in the line at proper distances, the wall is then built two and a half or three feet high, and boards nailed to the posts above the required height, or two rails added, holes for which should be made in the posts previous to their being put down. The posts serve to steady and preserve the wall; and they should be of durable materials, as cedar, locust, &c., as their situation subjects them to rapid decay. Another mode is to insert three foot posts into pieces of stout plank or blocks of wood, to be worked into the wall one and a half or two feet above the surface of the ground, and to close the wall over them, and then add boards or rails as before. 3. Wall with riders. This is built of any convenient height, of stones; poles or rails are then laid lengthwise upon the top; stakes to cross are inserted, which keep the poles in place, and support other poles or rails placed on them, which completes the structure.

III. LIVE FENCES OR HEDGES.

For many years past, great efforts have been made to introduce live hedges or fences, in place of those of timber and stone. Partial success has, in some instances, for awhile, flattered the hopes of the persevering experimenter; but in general, the efforts have resulted in failure. The introduction of the English thorn, has long been a favourite object with many gentlemen,* and we cannot conceive why, with proper man-

* Mr. Caleb Kirk, of Delaware, was one of the most zealous advocates of

agement, they would not attain the same degree of perfection and usefulness in the southern states as in England. They are not adapted to upland regions. In the choice of plants for a hedge, the influence of soil and climate should be particularly considered, as upon these and right management, more than any thing else, will depend the success or failure. We should, therefore, rely more upon *native* than *foreign* plants.

That we have a variety of plants, in almost every section of our country, well adapted to all the purposes of hedging, no doubt can be entertained. Years ago, when a few individuals, bursting the shackles of prejudice, set themselves earnestly to work to improve and advance the agriculture of the country generally, this was one of the first subjects that claimed their attention. Numerous experiments were made in Pennsylvania, Delaware, Maryland, and more especially in Virginia. Fences of native as well as of foreign plants were set out; and, so far as we have been able to gain information, the advantage, as regards durability and use, was in favour of the native plant, portions of which are now standing.

The question which will naturally arise in the mind of the reader, taking the statement to be correct, will be, "why is it that these fences do not abound over the whole country—I never saw one?" The answer is simple—it is to be found in the character and spirit of our countrymen. Almost every thing of importance that has been accomplished in this great country, has been on the "high-pressure principle." The early advocates of agricultural improvements, among whom we find a WASHINGTON, a JEFFERSON, a PETERS, a LIVINGSTON, a PICKERING, a LINCOLN, a TAYLOR, a GARNETT,* a COOPER, a BORDLEY, a LORAIN, a WORTH, and many other illustrious men, were not sustained by the great mass of the people—for whose benefit, and not their own, they laboured. In this case, those farmers, we presume, who were induced, or, perhaps, *persuaded* by its friends to turn their attention to this subject, did not expect *too great*, but too IMMEDIATE RESULTS. This is the rock on which thousands fail. Lacking persevering patience, they become lukewarm in an enterprise—lose their interest, after which, total neglect, if not absolute disgust, ensues.

Among the variety of *native plants*, the *red cedar* was the

this system of fencing. He laboured long and diligently, and was, we believe, more successful than any other gentleman, in raising live hedges of the English thorn. The country is greatly indebted to him for his persevering and praiseworthy efforts.

* Mr. GARNETT is still opposed, as he has ever been, to the introduction of live hedges. His zeal in the cause of agriculture has increased with his years. His efforts indicate all the vigour of youth.

most conspicuous, as it was probably the most valuable. The late Col. John Taylor, of Caroline, Va., recommended it as answering every desirable purpose. With proper care and attention, a hedge of great beauty, strength, and durability may be formed of the cedar in about seven years from the period of planting.

For the purpose of raising a *nursery of cedar plants*, let the berries be gathered in November and December, and having detached the resinous substance in which the seeds are enveloped, as far as practicable, which may be done by grubbing, mix them with unslaked ashes, in which let them remain two weeks—then plant them in drills after the manner of planting peas—and, if good, they will vegetate and come up the following spring. With good nursing, they will be fit for removal into a hedge in two years. The trenches in which they are to be placed should be prepared with light rich earth. The first of March is the proper time for planting them. When the plants have attained the height of three feet, the trimming should commence; the best time for which is the middle of summer. The more thoroughly the seeds are cleansed, and the earlier the plants are set out in the spring the better.—*Farmer's Guide.*

Colonel Taylor's *method of planting the cedar hedge.*—From December to the middle of March, the smallest plants are to be taken up in a sod of a square conformable to the size of the spade used, as deep as possible, which sod is to be deposited unbroken in a hole as deep, made by a similar spade, the earth being used to fill up the crevices between the sod and the hole for its reception. I plant these cedars on the out and inside of a straight fence, on the ridge of a ditch, the plants in each row being two feet apart, both in the direction of and across this ridge, but so that the plants on one side of the fence will be opposite to the centre of the vacancies between those on the other. They should be topped at a foot high, and not suffered to gain more than four inches yearly in height, such boughs or branches excepted as can be worked into the fence at the ground. Of these great use may be made in thickening the hedge by bending them to the ground and covering them well with earth in the middle, leaving them growing to the stem and their extremities exposed—thus they invariably take root and fill up gaps. If properly cultivated, and the land is strong, they will form an elegant live ever-green fence in a shorter time than is necessary to raise a thorn fence in England.—*Taylor's Arator, third edition, page* 174. Several years after the above was written and published, Mr. Taylor says, in a note on the subject, "my experiments in cedar-hedging have become two or three years older, and have removed every doubt of its cheapness, practicability and importance."

When speaking of *live-hedge*, the *English thorn, hawthorn*, or, as it is sometimes called, *quick*, is generally understood. We have already adverted to its introduction in this country, and can only refer in brief terms to its management. A *proper choice of plants* is of vast importance. The hawthorn is readily produced from the seeds of its fruit, is best raised in the nursery, and in two years transplanted from the seed bud, in the line of the fence. The *preparation of the soil* is a point of the first importance; as it will constitute in many cases the difference between success and failure. The ground on the line of the fence should undergo a complete preparation by deep and effectual ploughing, or trenching with the spade, and by a thorough manuring. Where a quantity of vegetable matter is present in the soil, lime may be used—but where the soil is poor, both lime and dung should be applied.

The line of fence being determined, it is laid off by means of poles like the ridges of a field, and marked upon the ground. The line of the side of the ditch along which the thorns are to be set, being marked out by the rod and line, and notched by the spade, the workman takes off a part of the earth from the surface of the intended ditch, and lays it along the future line of thorns, about six inches back of the notched line. This forms what is called a scarcement. He then beats down the earth or sods thus laid with his spade, so that the outer surface shall be in the line of the future mound, sloping a little backward. It is upon the row of earth or sods thus placed, technically called the thorn-bed, that the thorns to be planted are laid. A further portion of the surface of the ditch is then stripped off and thrown behind the thorn-bed. The plants, the stems of which are generally eight inches high, exclusive of the root, are to be placed firmly upon the thorn-bed, so that when the mound is made, they may project a very little beyond the surface, or rather just reach it. The distance at which they may be planted from one another, is about eight inches. While one or more persons are engaged in laying the thorns, another is to shovel up from the ditch the loose mould immediately next the surface, and place it upon the stems of the plants. This earth being compressed by the foot, the plants will be firmly fixed in their position. The ditch is cleared out to its full depth, and the earth thrown upon the bank. The mound is then to be rounded at the top, and beat all around by the shovel; and this process completes the formation of the hedge and ditch. The ditch should be narrowed to a spade-breadth at bottom, and so laid out as to permit the regular descent of water. The sides may be made to slope at an angle of 45°. The proper time for planting is from October to the beginning of March, or while vegetation is inert.—*Professor Low's Elements.*

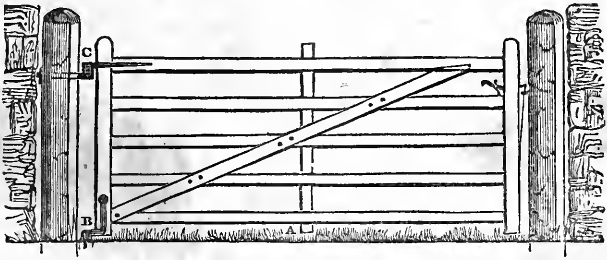
In the *after culture of the hedge*, which must be rigidly attended to, for the first four or five years especially, the application of new and rich earth to the roots, thorough weeding and loosening the earth of the mound, which is apt to become baked and hard, must not be overlooked—neglect, in this case, would be fatal. Obstructions should also, whenever they present themselves, be immediately removed, so that the passage of water may not be interrupted. The value and beauty of the hedge, depends in a great degree upon the management of it while in its young and tender state. The greatest possible care and judgment is to be exercised in pruning. Loudon says, that from the first year of planting till the hedge has risen to five or six feet in height, the main stems ought to be left untouched, and the pruning confined solely to the side branches, leaving those next the root pretty long, and gradually tapering towards the top.

We have now described the elementary species of the live or hedge fence, which is the base or foundation of all the others. There are also *compound fences*, the principal and most efficient of which is the stone wall and live fence combined. But as it is not likely to be of much practical service, the description is omitted, as well as the description of palings and ornamental fences.

IV. GATES.

Another point to be considered in relation to the fence is the gate, which may be regarded as a moveable portion. The properties of a good gate are that it shall combine with lightness the necessary strength, so that an equal quantity of materials shall produce the strongest gate. The absolute strength of materials depends on their hardness and tenacity. A neat and substantial gate, sufficient for all necessary purposes, may consist of a set of horizontal bars, firmly bound together, and placed at such distances as to prevent the passage of animals.

The following figure represents a gate with five horizontal bars, well secured and rendered firm by a diagonal bar, projecting from the lower to the upper corner, with an upright brace in the centre, but on the opposite side. The following description of an excellent gate, but of simple and cheap construction, is by Professor Low.



"The gate may be hung on two hinges—or the heel of the gate may rest in a socket placed in the ground. The bars, by tapering towards the fore-part, diminish the tendency of that part to sink. When a gate sinks at the head, it may be considered as a bended lever, of which the fulcrum is at B, the power at C, and the weight the centre of gravity of the gate, which, in case of its being of uniform materials, will be represented on the lower bar at A. Hence, by increasing the length of B C in proportion to B A, the power of the hinge at C to support the weight of the gate is increased. This power is further increased, when the gate is made heavier at its posterior part, so as to bring the centre of gravity nearer to B. In practice, therefore, the hinges should be kept at as great a distance from each other as possible, and the gate should be made light towards its anterior part."

In the figure, five horizontal and two upright bars at the extremities are shown—into these two outer upright bars, the horizontal bars are secured firmly by morticing. The diagonal brace from the higher to the lower corner, consists of a plank of suitable dimensions. The horizontal bars taper from the hinderpart to the forepart. The length of the gate may be nine feet, the height over the horizontal bars four feet, the lower bar standing about six inches from the ground. The length, height, &c. of the gate may be varied to suit circumstances—but the proportions should be preserved.

The *posts* may consist of wood, well sunk in the ground—any coarse timber of sufficient strength and durability may be employed. But we would earnestly recommend in every case where they can be obtained, single stones of *granite*, *greenstone*, or any harder rock that can be fashioned into the shape of a pillar. The band of the hinge should pass through the wood or stone, as shewn in the figure, and firmly fixed by a bolt or screw nut on the opposite side. The band of the latch and hinge should in like manner pass through the post or stone pillar, and be fixed by a screw nut.

The *latch* may be of various forms. That shewn in the figure is a spring two feet in length, to which at right angles is fixed a piece of iron which passes through the upright bar of the gate. This piece of iron, by means of two joints, acts as a lever when the hand is placed upon it, and withdraws the latch.

All the mortices of a gate, and the parts at which the diagonal and braces cross the bars, should be carefully coated with white lead—and after the parts of the gate are joined together, the whole should receive two efficient coats of good oil paint. Gates are sometimes, as a matter of convenience, so hung as to shut of themselves when opened. We should think it best to have the hinges move in a socket; as they are more firmly supported, and can be made to move more smoothly by occasionally introducing into the socket a small portion of oil.

XVI.—THE DAIRY.

Dairy is the term universally applied to the place where the milk of cows is kept and converted into butter or cheese, or both. The operation is called *dairying*—and land, the major part of which is devoted to the maintenance of cows for this purpose, is called a *dairy-farm.* The dairy-house, if properly constructed, will consist of three apartments, (which will be noticed, briefly, however, hereafter,) viz: one for milk; another for butter in churning; or for scalding, pressing, and salting cheese; and a third for implements—over which, in cheese dairies, a store-room may be placed, if deemed necessary.

In the practice of the dairy in this country, milk may be consumed in three ways. The first is in the form of milk for food—and this is the most profitable, where, from the nearness of the market, and the demand for the produce, it can be adopted. In the vicinity of cities and large towns, dairies are formed merely for the production of milk; these usually form the largest class of dairy establishments. But the sale of milk in its fresh state, is necessarily limited to a certain circle around the different markets of consumption.

The next, and most profitable production of the dairy, is butter in a fresh state. This circle is more extended than that of milk alone, because butter can be preserved longer, and conveyed to a much greater distance. At a greater distance still the produce consists of cheese, and sometimes cheese and butter—when the latter is produced it is put down in tubs and firkins, and salted for preservation. We believe that in this country, the combined production of cheese and butter, is attended to in nearly if not all our dairies.

Milk is a fluid secreted by the female of all those animals denominated Mammalia—and intended evidently for the nourishment of their offspring. The milk of every animal has certain peculiarities which distinguishes it from every other milk. The milk of the cow is most used by man as an article of food, and consequently more particularly claiming their attention. Chemists, therefore, have made choice of it for their experiments. Milk is an opaque fluid, of a whitish colour, a slight peculiar smell, and a pleasant, sweetish taste. When newly drawn from the cow, it has a taste very different from that which it acquires after it has been kept for some hours.

Cream is a thick, unctuous, yellowish coloured substance, which collects on the surface of milk, when it (the milk) is permitted to remain for some time at rest. After the cream is separated the remaining milk is of a bluish-white colour, and is much thinner than it was before. If it be heated to the temperature of 100°, and a little rennet, which is water digested with the inner coat of a calf's stomach, preserved with salt, be added to it, coagulation ensues; and if the coagulum be broken, the milk very soon separates into two substances; a solid white part known by the name of curd, and a fluid part called whey. Thus we see that milk may be easily separated into three parts, namely—cream, curd, and whey.

Cream cheese.—Cream gradually increases in consistence by exposure to the atmosphere. In three or four days it becomes so thick that the vessel which contains it may be inverted without risking any loss. In eight or ten days more its surface is covered over with mucus and byssi, and it has no longer the flavour of cream, but of very fat cheese. This is the process for making what in this country is called cream cheese.

Cream possesses many of the properties of an oil. It is specifically lighter than water; it has an unctuous feel, staining cloths precisely in the manner of oil; and if it be kept fluid, it contracts a taste very analogous to the rancidity of oils.

These properties are sufficient to show us that it contains a quantity of oil; but this oil is combined with a part of the curd, and mixed with some serum. Cream, then, is composed of a peculiar oil, curd, and serum. The oil may be easily obtained separate by agitating the cream for a considerable time. This process is usually called churning. The continuance of this operation for a sufficient time causes the cream to separate into two portions: one fluid, and resembling creamed milk, called butter-milk,—the other solid, and called butter.

Butter is of a yellow colour, possessing the properties of an oil, and mixes readily with other oily bodies. When heated to the temperature of 96° it melts and becomes transparent; if it be kept for some time melted, some curd and whey separates from it, and it assumes exactly the appearance of oil. When butter is kept for a certain time, it becomes rancid, owing in a good measure to the presence of these foreign ingredients; for if butter be well washed, and a great portion of these matters separated, it does not become rancid near so soon. Butter may be obtained by agitating cream newly taken from milk; or even by agitating milk newly drawn from the cow. But it is usual to allow cream to remain for some time before it is churned. Now, cream, by standing, acquires an acid taste; butter, therefore, is commonly made from sour cream. Fresh cream requires longer churning before it yields its butter than sour cream does; consequently cream acquires, by being kept for some time, new properties, in consequence of which, it is more easily converted into butter, which in all cases is perfectly sweet.

The affinity of the oil of cream for the other ingredients is such, that it never separates completely from them. Not only is curd and whey always found in the cream, but some of this oil is constantly found in creamed milk, and even in whey it has been ascertained by experiments that butter may be obtained by churning whey. This accounts for the fact that more butter may be obtained from the same quantity of milk, if it be churned as drawn from the cow, than when the cream alone is collected and churned.

Curd, which may be separated from creamed milk by rennet, has many of the properties of coagulated albumen. It is white and solid; and when all the moisture is squeezed out, it has a good deal of brittleness. Curd is used in making cheese, and the cheese is the better the more it contains of cream, or of that oily matter which constitutes cream. It is known to cheese-makers, that the goodness of it depends in a great measure on the manner of separating the whey from the curd. If the milk be much heated, the coagulum broken in pieces, and the whey forcibly separated, the cheese is scarcely good for any thing; but the whey is delicious, and butter may be obtained from it in considerable quantity. Whereas, if the milk be not too much heated, (about 100° is sufficient,) if the coagulum be allowed to remain unbroken, and the whey be separated by very slow and gentle pressure, the cheese is good.

A dairy, more especially if within the reach of a ready market, may be profitably conducted on a moderate scale, in conjunction with an arable farm; as a small portion of pasture land, either natural or artificial, will answer every useful purpose in connection with the sugar-beet, ruta-baga, and other roots, which are easily raised in great abundance, and which, as a general rule in the hands of competent persons, not only cause an increase in the *quantity*, but also a great improvement in the *richness* and flavour of the milk and butter produced from an equal number of cows. The dairy business is in no degree hazardous, if it is conducted as it should be, as well as all other departments of agriculture—on sound principles. The market is subject to few or trifling fluctuations.

There are various points essential to the successful and profitable management of a dairy. A few only of the most prominent are here noticed. 1. The animals should be of a good breed; that is, kind and free milkers. 2. The greatest care and attention should be devoted to them in order that they may be kept in good heart and condition. 3. Suitable buildings and implements necessary to the complete and perfect management of the dairy. 4. Skill, and the utmost cleanliness and attention on the part of those persons, (whether proprietors or hired for the purpose,) to whom the business may be confided.

As regards the animal best adapted to the purposes of the dairy, a great diversity of opinion prevails among gentlemen most deeply interested in the subject. Some hold the *short-horns*, which certainly possess many excellent points, in the highest esteem; while others, equally competent to come to correct conclusions, give a decided preference to *long-horns*. The fact is, there are good and bad milkers to be found among all breeds of cattle—and this difference is owing to a great variety of causes. It is of great importance to know the temper of a cow—it may appear as a trifling matter at first view, yet, from our experience, we regard it as one of great importance. A cow of kindly disposition, gives but little trouble in her management—parts with her milk readily and cheerfully, and yields a far more abundant supply than one of an unruly disposition. A farmer ought not to keep an unruly animal, it is a source of continual vexation, frequently of loss, beside the tendency of its bad example.

Upon the form and qualifications of a perfect cow we refer to Mr. YOUATT,* merely observing that, whatever breed may be selected, there is a wide difference between the form of one meant for fattening, and that intended for the dairy.† "Thus, while the former should have all the best points of the ox, as nearly as possible, the milch cow should, on the contrary, have a long thin head, with a brisk but placid eye—thin and hollow in the neck—narrow in the breast and the point of the shoulder—altogether light in the fore-quarters—wide in the loins—little dewlap—neither too full fleshed along the chine, nor shewing in any part an indication to put on much fat. The udder should especially be large, round and full, with the milk veins protruding, yet thin skinned, but not hanging loose or tending very far behind. The teats should also stand square, all pointing out at equal distances, and of the same size; and although neither very large nor thick towards the udder, yet long and tapering to a point. A cow with a large head, a high back-bone, a small udder and teats, and drawn up in the belly, will, beyond all doubt, be found a bad milker." The hide should be thin, the hair fine and soft to the touch, and the tail small.

The most desirable qualities of a dairy cow are, that she should give an abundant supply of milk, and that of a rich kind—that she should be perfectly kind and docile, and readily yield her milk—fatten easily. But it would appear from many unsuccessful efforts, that the properties necessary to constitute a good dairy cow, and those necessary to fit one for the shambles, in the least time and at the least expense, are very seldom united or combined in the same animal. "Years of useless

* Author of the popular work on British Cattle.
† British Husbandry, p. 397.

effort, to unite these two irreconcileable properties, have proved that the different breeds of neat cattle have not hitherto been brought to entire perfection." We have many instances on record, in which our *native cattle* have proved themselves not only very superior milkers, as regards quantity and quality, but that when put up, they take on fat equal to the best of imported stock.

The pasture and other food best adapted for cows as it regards their milk, are merely referred to here, as they are treated of more fully under their respective heads.* The animal should be suited to the fertility of the soil—and as remarked in the article on grazing, cattle ought not to be brought from superior to inferior pastures—for instances have occurred in which six cows fed on some pastures, have yielded as much milk as nine or even twelve will afford on inferior ground.

The food, of whatever kind, should be well prepared, and administered at regular intervals. On exactness in this respect a great measure of success depends. Milch cows require a full supply of the most nutritious and succulent food—and it is not only essential that it be of a good quality, but that it be of such quality as is relished by the cattle. Many dairymen pasture their cows during summer—others, the practice is becoming more general, have adopted the soiling system. In winter, stall-feeding is recommended and generally adopted. But the utmost order and regularity should be observed. The building should be well ventilated in winter as well as in summer—cleansed every day in the most perfect manner—the cows should all be curried, and have a plentiful supply of water, which, if well thickened with Indian meal, will be the better.†

Some experienced and intelligent graziers and dairymen, maintain that good natural pastures are far superior to the best of roots and the artificial grasses, producing a greater yield of milk, and a better flavour in the butter, than is produced from soiling. No farmer should be deterred, however, from this opinion, from feeding his dairy stock on the soiling principle, as the advantages of that over the old system are great, and may be ascertained by any one who will take the pains to promote his own interest, by making a fair and just experiment.

Much more generally depends upon the construction of

* See articles Grazing, Soiling, Stall-feeding, Hay, Grass, Roots, &c. &c.

† Ezekiel Rhodes, a worthy farmer of Montgomery county, and a man of great observation and penetration, says—That within one week after his sugar-beets were exhausted, the butter from his cows was reduced one-third, (within a fraction,) and that the butter he made and sold during the time his cows were fed mainly on sugar-beets, was in much higher repute than it had ever been before.

the cow-house than many persons suppose. It should be perfectly dry, very airy, and comfortably warm. The greatest attention must be paid to the cleanliness of the house; and the management of the cows must in no case be confided to an inexperienced, incompetent, or unfaithful person; and no one should be employed about cattle, of any description, who possesses a bad or ungovernable temper, as cattle require kind and gentle treatment.*

Milking is a process that requires extreme care and nicety, as the manner in which it is performed is apt to diminish the quantity and impair the quality. During the summer season, cows, if well fed, should be milked three times a day—early in the morning, at noon, and just before nightfall—and nothing is of greater importance than to have the milk thoroughly drawn from the cow; not solely because that last drawn is the richest, but also because whatever portion is suffered to remain is re-absorbed in the system, and at the next milking a less quantity is yielded. This fact is accounted for on the principle that nature generates no more than is necessary to supply the waste of that taken away. Therefore, if this imperfect system is permitted, the produce of the dairy will be greatly diminished, and the cow, in the process of time, cease to yield her milk.

The late Dr. James Anderson, whose name is intimately and honourably connected with the cause of agriculture, and who for many years was one of its brightest ornaments and ablest advocates, combining scientific knowledge with great practical experience, furnished for the Bath, west of England, Agricultural Society,† a valuable paper "On the Management of the Dairy, particularly with respect to the making and curing of butter." To this day, and in all dairy countries, this paper is considered as of the highest authority: though of considerable length, it may be found published entire in the third volume of the Farmer's Cabinet, and also in the Farmer's Register for the year 1839. The following extracts will give

* Cows should always be treated with great gentleness, and soothed by mild usage, especially when young and ticklish, or when the paps are tender; in which last case, the udder ought to be fomented with warm water before milking, and touched with the greatest gentleness, otherwise the cow will be in danger of contracting bad habits, becoming stubborn and unruly, and retaining her milk ever after. A cow never lets down her milk pleasantly to the person she dreads or dislikes. The udder and paps should always be washed with clean water before milking; but care should be taken that none of that water be admitted into the milking pail.

† This society we believe is still in existence. It has been the means of effecting great improvements in the various departments of agriculture, and numbered among its members and correspondents some of the most intelligent and worthy men of this country.

the Doctor's views on the subject of milk. The facts set forth are very important, and ought to be deeply impressed on the minds of all who have the oversight or management of dairies. They are given by the author in the form of aphorisms, that they may be the more readily adverted to, and the easier retained.

Aphorism I.—Of the milk that is drawn from any cow at one time, that which comes off at the first is always thinner and of a much worse quality than that which comes afterwards, and the richness goes on continually increasing to the very last drop that can be drawn from the udder at that time.

Among farmers in this country, the last drawn milk from the cow is termed *stroakings*, and it is well known that it is much superior in point of richness to that which is drawn at first—but few have any conception of the vast disproportion in the quality of the first and last drawn milk from the same cow, at one milking. The fact was long since ascertained by Dr. Anderson, and confirmed by many years subsequent experiments and observation, and holds good to the present day. He took a number of cups, of the same size and shape, one was filled at the beginning of the milking, and the others at regular intervals, the last being filled by the stroakings. The result was "that the cream from some cows, exceeded that from the first, in the proportion of *sixteen* to *one*. In other cows, however, and in particular circumstances, the disproportion was not quite so great; but in no case did I find it fall short of the rate of *eight* to *one*. Probably, upon an average of a great many cows, it might be found to run at *ten* or *twelve* to *one*."

The difference in the *quality* of the cream, however, obtained, was much greater than the difference in the *quantity*. In the first cup the cream was a thin tough film, thinner and perhaps whiter than the paper on which I write; in the last, the cream was of a thick *butyrous* consistence, and of a glowing richness of colour, that no other kind of cream is ever found to possess. The difference in the quality of the *milk* that remained after the cream was separated, was perhaps still greater than either in respect to the quantity or the quality of the cream. The milk in the first cup was a thin bluish liquid, like as if a very large proportion of water had been mixed with ordinary milk; that in the last cup was of a thick consistence and yellow colour, more resembling cream than milk, both in taste and appearance. From this important experiment it appears, that the person who, by bad milking of his cows, loses but half a pint of the milk, loses in fact about as much cream as would be afforded by six or eight pints at the beginning, and loses besides, that part of the cream which alone can give richness and high flavour to his butter.

Aphorism II.—If milk be put in a dish and allowed to stand till it throws up cream, that portion of cream which rises first to the surface is richer in quality, and greater in quantity, than what rises in a second equal portion of time; and the cream that rises in the second interval of time is greater in quantity and richer in quality than that which rises in a third equal space of time; and that of the third than the fourth, and so on, the cream that rises decreases in quantity, and declines in quality continually, as long as any rises to the surface.

Aphorism III.—Thick milk always throws up a smaller proportion of the cream it actually contains to the surface, than milk that is thinner, but that cream is of a richer quality; and if water be added to that thick milk it will afford a considerably greater quantity of cream than it would have done if allowed to remain pure; but its quality is at the same time greatly debased.

Aphorism IV.—Milk which is put into a bucket or other proper vessel, and carried in it to any considerable distance, so as to be much agitated and in part cooled before it be put into the milk-pans to settle for cream, never throws up as much nor so rich cream, as if the same milk had been put into the milk-pans directly after it was milked.

A practice prevails among dairymen of putting all the milk of all the cows in one large vessel. This certainly is not good practice, as the produce of a large dairy may be greatly debased by the milk of one bad cow. If the milk from each cow be placed in separate pans, the farmer will be able to form a correct judgment as to the quantity and quality—and also, what is highly important, he will know which of his cows it is his interest to dispose of to the butcher, and likewise those most desirable for breeding. It should be remembered that the true value of a milker, does not consist so much in her appearance, as in the quantity and quality of the milk yielded.

When butter of a very superior quality is desired, the milk last drawn must be reserved for the purpose. It is stated by Dr. Anderson—but a difference of opinion is entertained on this point—that the best butter can only be, with economy, made in those dairies where the manufacture of cheese is the principal object. The reason is obvious. The stroakings, or the cream which rises during the three or four first hours, (which is generally conceded to be the richest portion,) is taken for the butter, and the remainder converted into cheese, with nearly as great advantage as the new milk itself.

A correspondent of the Cultivator, Mr. James Smealle, in noticing the difference that exists in butter, says, "some butter is very fine, while another parcel is unfit for the table, yet both the good and the bad are obtained from milk possessing exactly the same properties. It is evident that it is not to the milk, but to the *management* of it, that we must look for the cause of that great diversity of quality existing in butter."

The properties of a good milk-room are, that it be cool in summer and moderately warm in winter, so as to preserve throughout the year a temperature of from 50° to 55°; for this purpose a stone wall will be necessary in winter. A good thermometer will also be found an indispensable article. It should have its windows to the north—well ventilated, perfectly dry, sweet and clean; and no putrid substances should be permitted to remain for the shortest space of time in its neighbourhood—every thing in and around the building must be in perfect order, and the most scrupulous regard to cleanliness be observed. The windows should be formed of gauze-cloth, which will exclude flies, but admit the air, and protected from mice and accidents by a grating of wire. Glass sashes are to be provided for winter.

The work-room, in which the different manual operations are to be performed, is to be fitted up with a boiler for heating both water and milk; and this room in ordinary cases should be sufficiently large for performing all the necessary in-door operations of the dairy. But where a farm is exclusively almost, devoted to this business, or the dairy, on a mixed farm, is unusually large, separate apartments should be provided for the different processes of churning, cheese-making, and cleansing the vessels.

The store-room is designed as a repository of the produce of the dairy, butter or cheese, or both, when made, where they may be kept securely until it may be advisable to remove them. Without being too much heated or lighted, it should possess a certain degree of warmth—it may be placed where most convenient.

The utensils necessary for a dairy are, 1. Milking-pails formed of wood. 2. Sieves of hair or wire-gauze for straining the milk and retaining its impurities.* 3. Vessels for holding

* *Description of* Mr. PEDDER's *pans, and mode of using them.*—Each pan is placed on a strong wooden frame of the most convenient height; is dish-shaped, either square or oblong; the largest being about five feet six inches long by thirty inches wide: smaller pans can be made to order. They are *double*, the pan for the milk being firmly joined to another of the same shape, but somewhat larger, which forms a casing around it; the space between them being from two to three inches deep, is for the purpose of containing hot water, thus forming a bath around the milk. In the centre of the upper or milk pan, which dips regularly towards the middle, is a fine strainer; and to this is attached a short pipe, which descends through the bottom of the casing pan, of which, however, it is independent; it is furnished with a brass tap, its purpose being to let off the milk contained in the upper pan, at the end of the process. The casing, or bottom pan, is furnished with two pipes; one perforates a corner of the upper or milk pan, and through this, boiling water is poured by means of a funnel at the proper time, so as completely to fill the space between the pans—thus, as has been said, forming a hot bath around the milk. By the other pipe, furnished also with a tap, the water is let off at the proper season. Thus the pans, although firmly joined together, are independent of each other, the union, however, strengthening each in a remarkable manner.

At the time of milking, the taps are closed, and the upper pan is to be filled with the milk as it comes from the cows; after standing twelve hours, the tap is partially unclosed, and a small portion of the milk is drawn away; this, on examination, will be found to contain the impurities of the milk, which have subsided; (the peculiar formation of the pan having induced the sediment to form exactly on the strainer,) and this economy is of much consequence to the quality of the butter. The casing, or bottom pan, is then to be filled with *boiling* water, by means of the pipe which perforates the upper pan, which is then the milk until the cream rises upon the surface, and a vessel for containing the cream. 4. Flat dishes of willow, ivory, or horn, for the purpose of skimming the cream from the surface of the milk. 5. A churn. 6. A wooden vat or tub in which the milk is placed when the curd is coagulated. 7. A cheese-knife, for the purpose of cutting or breaking the coagulated curd, that the whey may be separated. 8. A vessel perforated with holes, in which the curd may be placed, that it may be broken, and the serous matter further separated. 9. Wooden vessels, with perforated side and bottom, in which the curd is placed for being compressed. 10. A cheese press. These articles are mostly figured and described in the chapter on agricultural implements.

Various materials are used in the construction of milk dishes and other dairy utensils. The employment of leaden vessels, in any way, should be wholly discarded. Cast iron, smoothed within and coated with tin is recommended by Professor Low, who says, that cast iron and zinc are superior to the more common material, wood—as they are more easily kept clean, and sooner cooled, which contributes to the more ready separation of the cream. If the traces of arsenic found in zinc can be neutralized, then would we recommend it for general use; but if not, we would adhere to wooden vessels properly constructed, as being free from all the serious objections raised against those formed of metal. They can, with proper attention and labour, be kept sweet, clean, and free from every taint.

There are a great variety of churns of different modes of construction, the most common of which is the ancient implement, moved by hand and called the plunge-churn. The form of this domestic instrument is every where known. It consists of a cylindrical vessel of wood placed upright; it acts by means of a long handle furnished at the inner end with a perforated board, which nearly fits the cylinder; this is worked up and down by the dairy-maid, which agitates the milk until the butter is separated. This is considered the most efficient,

to be closed; and the water is permitted to stand twelve hours, when it is to be drawn off by the tap below, opening first the pipe above, to give vent. After this, the milk is to be drawn off, by placing a vessel to receive it, and opening the tap; every particle of the cream having risen to the surface. Thus the milk will be found to drain away, leaving the cream in the pan, from whence it can be removed with the greatest ease and facility; very little practice in this part of the process will make perfect. As soon, however, as the cream is removed, the pan should be well washed with hot water and soap, which will neutralize any acidity there might be; and a careful rincing after, fits it for an immediate re-filling without removal or labour.

The cream might now be transferred to the churn, where it will soon become butter of the finest quality; or might be "brought" by merely stirring with the hand in a pan, after the Devonshire method; either way, which is thought most convenient.

but tedious and laborious process, and will answer only when the quantity made is small. The barrel-churn, and others of improved construction, is recommended. A critical examination of the different kinds should be had before purchasing—and the dairyman should fully understand the principles upon which his patent or improved churn is constructed.

Butter may be obtained either by separating the cream from the milk and then churning it, or by churning the milk and cream together. By the first method, the best butter is obtained—by the second, the largest quantity. It is a point of practice with many Pennsylvania farmers to cool the milk as soon as drawn from the cows, by reducing it to the temperature of the interior of the milk-house, which in summer scarcely exceeds 50°. By this means, the milk remains sweet much longer than it otherwise would, and sufficient time is allowed for it to throw up all the cream, so there is no loss.

If it is concluded to have the butter produced from cream, the cream from each successive milking is put into a vessel until a sufficient quantity shall be collected; when the quantity is obtained, and before the cream arrives at too great a degree of acidity, it is put into the churn, in which, after being regularly agitated for about the space of an hour, the butter will be separated. It appears in the shape of small kernels, which are united by the pressure of the dasher against the bottom of the churn, and soon forms a solid mass of butter, which is then removed, carefully worked and kneaded in cold water, until the milk is entirely separated, which is known by the water coming off pure and clear.* "The best temperature of the cream for the separation of the butter, appears to be about 60°—in cold weather it may be raised somewhat higher by the addition of hot water."

It is frequently the case, that butter when taken from the churn, is worked too much; that is, the process of working by the hand, beating and pressing it down with a cloth, in order that the remaining milk may be absorbed, is carried to excess. The less it is kneaded or beaten the better; for the more it is worked, the more tough and gluey it will become. When the

* Judge Buel says, "our dairywomen have added two rules, viz:—1. "That no water be suffered to come in contact with the butter in any stage of its process; because it tends to lessen the essential volatile matter (principle) which gives to butter its rich peculiar flavour. 2. To have the salt incorporated with the butter in the first operation of working; and after an interval of twenty-four hours, to apply again the butter ladle until the whole of the liquid is expelled. By this operation the salt is dissolved and effectually blended with the butter, which is freed more completely from the butter-milk." The practice is certainly not to be commended; and it has been relinquished in many well managed dairies in the butter circle of Philadelphia.

butter is used fresh, a small portion of the best and purest salt will be sufficient.

But by far the greatest portion of butter is made at a distance from large towns, which is salted down in kegs, tubs and firkins, containing generally from fifty-six to one hundred pounds. ☞ The quality of the salt used is of great importance—if it be pure, the butter will retain its flavour for a long time—but when it is impure, and contains bitter and deliquescent salts, the butter will soon become rancid. The Germans are very particular on this point. They use a kind of salt made by slow evaporation, and perfectly chrystallized. The salt is intimately mixed with the butter. From three to five pounds are sufficient for a firkin of fifty-six pounds.*

In packing or salting down butter the greatest possible degree of caution, nicety and exactness is to be observed. The butter having been formed by the process of churning, and perfectly cleansed from all particles of milk, is supposed to be ready to undergo the process of salting and packing. The vessel into which the butter is to be placed, after having been rendered as clean and sweet as possible, must be well rubbed all over in the inside with common salt—a little melted butter should be run into the cavity between the bottom and the sides, at their joining, all round, so as to fill it, and make it every where flush within the bottom and sides. It is then fit to receive the butter.

For the preservation of butter, even in the warmest climate, Dr. Anderson found, from some years experience, that the following named composition—the properties of which we believe were discovered by his amiable lady—was far preferable to salt alone, as it not only preserves the butter more effectually from all taint of rancidity, but makes it also look better, and taste sweeter, richer, and more marrowy, than portions of the same butter cured with common salt.—*Composition.* Take of sugar one part, of nitre one part, and of the best Spanish great salt (or rock salt) two parts. Beat the whole into a fine powder, mix them well together, and put them by for use. The Doctor continues:

> Of this composition one ounce should be put to every sixteen ounces of butter; mix this salt thoroughly with the butter as soon as it has been freed from the milk, and put it, without loss of time, down into the vessel prepared to receive it, pressing it so close as to leave no air holes, or any kind of cavities within it. Smooth the surface, and if you expect that it will be above a day or two before you can add more, cover it close up with a piece of clean linen,

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* The following mixture has been found superior to salt alone for curing butter: half an ounce of dry salt, pounded fine, two drachms of sugar, and two drachms of saltpetre, for every pound of butter.

and above that a piece of wetted parchment, or, for want of that, fine linen that has been dipped in melted butter, that is exactly fitted to the edges of the vessel all round, so as to exclude the air as much as possible, without the assistance of any watery brine; when more butter is to be added, these coverings are to be taken off, and the butter applied close above the former, pressing it down and smoothing it as before, and so on till the vessel be full. When it is quite full, let the two covers be spread over it with the greatest care, and let a little melted butter be poured all round the edges, so as to fill up every cranny, and effectually exclude the air. A little salt may be then strewed over the whole, and the cover be firmly fixed down to remain close shut till it be opened for use. If all this be carefully done, the butter may be kept perfectly sound in this climate for many years. How many years I cannot tell; but I have seen it two years old, and in every respect as sweet and sound as when it was only a month old.

It deserves to be remarked, that butter cured in this manner does not taste well till it has stood at least a fortnight after being salted; but after that period is elapsed, it eats with a rich marrowy taste that no other butter ever acquires; and it tastes so little of salt, that a person who had been accustomed to eat butter cured with common salt only, would not imagine it had got one-fourth part of the salt that would be necessary to preserve it.

Judge Buel says—

Believing that butter may be kept sweet and good, in our climate, almost any length of time, if properly manufactured, and well taken care of, in order to test the validity of this opinion, we had two pots put down, one in June, and the other in August, 1834, more than twenty months ago; and on probing them with a tryer, while penning this article, the butter is found perfectly sweet, and seems to retain most of its original flavour and freshness.

In the manufacturing process, *no water is permitted to come in contact with the cream or butter*—because it is believed that water, and particularly soft water, dissipates much of the fine flavour that gives to butter its high value. The Orange county dairywomen say, "give us good hard water and we will make good butter;" for the reason, probably, that it abstracts less of the aroma from the butter than soft water. The temperature of the cream may be regulated by cold or hot water put into a tub, in which the churn may be plunged. If the cream is clean, it needs no washing; and if the butter is dirty, water will never clean it.

Nothing but good well pulverized salt is used in preserving the butter; this is *all* mixed, and *all* dissolved, in the mass, before the butter has its second, thorough and final working with the butter ladle, and which is not finished till *all* the buttermilk is expelled.

To avoid all taint from the butter vessels, and the better to exclude it from the air, which soon injures it, the butter is packed close in clean stone jars, and when nearly filled, is covered with a strong brine, rendered pure by previous boiling, skimming and settling. In twenty months this brine has been twice renewed, on the appearance of a film upon the surface of the old pickle. To preserve butter, air and water, and heat above 65 or 70 degrees are to be guarded against as much as possible. The brine upon the surface does not penetrate the mass, nor while sweet taint it, but thoroughly excludes the air.

The making of butter in winter is a very nice process, and at times attended with difficulty. On the farm of Dr. Jones, and in various sections of Virginia, the following process is adopted. Mrs. Jones prepares her cream for churning by heating the milk after it has stood from twelve to twenty-four hours, by placing it over coals the evening before churning. When it has nearly attained the boiling point, it is set by till morning. The cream is then skimmed off, and churned by stirring in an earthen vessel. The butter is delicately white and clear in its complexion, firm and fine flavoured.—*Complete Farmer.*

An interesting and valuable paper on the making of butter in cold weather, by the Rev. W. ALLEN, states the results of several trials, by which it appears that butter may be obtained in the coldest weather with as much ease as in the most favourable season of the year, if the cream, at the commencement of the churning, is brought to the temperature of 75°.

PROCESS OF CHEESE-MAKING.

The production of cheese includes the making of rennet—the selection of a colouring matter—the setting of the curd—and the management of the cheese in the press. Cheese consists of the caseous matter of milk united to a certain portion of the oily or creamy part. This oily portion adds to the flavour and richness of the cheese, and hence when good cheese is wanted, the cream should not be separated. Cheese, however, is made from milk from which the cream has been removed—it is then termed skimmed-milk cheese, and is of an inferior order.

In the making of cheese, there are certain principles which are essential, but slight variations in the process produce cheeses of very different qualities—and although the most important circumstance is the quality of the pasture on which the cows are fed, yet much depends on the mode in which the different stages of the fabrication are managed—hence, the great superiority of the cheeses of particular districts or dairies over those of others, without any apparent difference in the pasture.* By skill and great attention excellent cheeses are made in places where the pastures are not considered so well adapted to produce milk of a proper quality; and where cows are chiefly kept in stalls, and fed with a variety of natural and artificial grasses, roots and vegetables, superior cheese is often made.†

The season best adapted for cheese-making, so as to secure for it the greatest degree of richness, generally extends from the first of May until the middle of October. But in most dairies

* The cheese manufactured at the dairy of the late Judge CAPNER, of Flemington, New Jersey, was justly celebrated and eagerly sought after throughout the Union. This high reputation was acquired by *superior management* in its fabrication, for the pasture grounds generally, wherever attended to, in that region, were fully equal to those occupied by Mr. C., and in some parts of old Hunterdon, we believe the pasture grounds were better, and naturally more fertile.

† Penny Cyclopædia.

the fabrication of cheese is continued throughout the entire year. The prevailing opinion that good cheese cannot be made in winter, is erroneous. The cows should be well fed, and every possible degree of attention devoted to the making of the cheese—these, with a perfect knowledge of the business, we conceive to be all the requisites to ensure good cheese in the winter season. Milk, it is said, abounds most in caseous matter during the spring, and with the butyraceous in summer and autumn. Cheese may be made from the curd which has been formed by the coagulation of the milk when it turns sour; but, when thus obtained, it is hard and ill-flavoured—means have therefore been found to curdle it with "rennet."

The preparation of the rennet, as it is denominated, is a most important part of the process of cheese-making. What is termed rennet is nothing more than the stomach of an animal, in which the gastric juices are preserved by salt—the best is the stomach of a sucking calf. This juice rapidly coagulates the milk as the calf sucks; and the only difficulty is in collecting and keeping it from putrefaction, which begins from the instant the stomach is taken from the calf. The following may be considered the simplest, and perhaps the best, method of preservation.

As soon as a sucking calf is killed, the stomach should be taken out, and if the calf has sucked lately, it is all the better. The outer skin should be well scraped, and all fat and useless membranes removed. It is only the inner coat which must be preserved. The coagulated milk should be taken out and examined, and any substance beside curd found in it should be carefully removed. The serum left in it should be pressed out with a cloth. It should then be replaced in the stomach with a large quantity of the best salt. Some add a little alum and sal prunella—others, various herbs and spices, with a view of giving the cheese a peculiar flavour, but the plain simple salting is sufficient. The skins or vells, as they are called, are then put into a pan and covered with a saturated solution of salt, in which they are soaked for some hours—but there must be no more liquor than will moisten the vells. They are afterwards hung up to dry, a piece of light flat wood being put crosswise into each to stretch them out. They should be perfectly dried and look like parchment. In this state they may be kept for any length of time, and are at all times ready for use. In some places, at the time of making cheese, a piece of a vell is cut off and soaked for some hours in water or whey, and the whole is added to the warm milk. In other places, pieces of vell are put into a linen bag and soaked in warm water, until the water has acquired sufficient strength, which is proved by trying a portion of it in warm milk.

There are a variety of modes for preparing and using the rennet. Professor Low says, that when prepared for use, it is to be cut into small pieces and put into a jar, with a handful or two of salt. Water, which had been previously boiled and cooled again, is then poured upon it, and allowed to remain for two or three days. It is then drawn off, and a second infusion made, but with a smaller quantity of water. This, also, remains a few days, and being withdrawn, the two liquors are mixed together, strained through a cloth, and put into bottles to be used when required. This, we presume, is the approved Scotch method.

Experience is necessary to determine the quantity of rennet necessary to coagulate a given quantity of milk, as much necessarily depends upon its strength. Throughout the whole process of preparing and preserving rennet, too much attention cannot be paid to its cleanliness and sweetness—and if it be used after it has become foul or tainted, the cheese will become invariably affected by it; and will very often be rendered thereby unfit for use.*

Muriatic acid is used in very small quantities as a substitute for rennet, on the continent of Europe, and in other places. It is the use of this article which gives to the Dutch-cheese that pungent relish which induces so many persons to prefer it.

Colouring matter.—As cheese in its native state, that is, such as is well manufactured, being put together in proper time, the milk being of a proper degree of warmth, and in all other respects properly pressed, salted, and dried, is uniformly of a bright yellow cast, the idea of excellence is generally attached to cheese of such a colour. Hence it is, says Loudon, that it has become necessary for the dairyman who would dispose of his cheese to advantage, to impart a light yellow orange colour to it by artificial means.†

For imparting a colour to cheese the *Spanish arnotto* is unquestionably the best of all ingredients. It is a preparation of the *roucou*, (*Bixa orellana*,) which grows in the United States. The red pulp which cover the seeds of this tree, is suspended in hot water, and allowed to subside—and when dry, is formed into cakes or balls, which are further set aside until they become dry and firm. When *genuine*, one ounce of this substance will be sufficient to colour one hundred pounds of cheese. The usual way of applying it is to dip a piece of the requisite size and weight in a bowl of milk, and then rub it on a smooth stone until the milk assumes a deep red colour. This infusion is then to be added to milk of which cheese is intended to be made, in such quantity as will impart to the whole a bright orange colour, which will become the deeper in proportion to the age of the cheese. The mixing of the arnotto in no respect affects either its taste or smell.

In Cheshire, England, a somewhat different practice prevails. It is usual when the colouring matter is wanted to tie up about as much as is deemed sufficient in a linen rag, and placing it in half a pint of warm water, let it stand

* Farmer's Magazine, page 162.

† Marigolds boiled in milk, are also used for colouring cheese—to which they also impart a pleasant flavour. In winter, carrots scraped and boiled in milk, afterwards strained, will produce a richer colour; but they should be used with great moderation on account of their taste.

over night. In the morning, immediately before the milk is coagulated, the whole of this infusion is mixed with it in the cheese-tub, and the rag is dipped in the milk, and rubbed on the palm of the hand until all the colouring matter is completely extracted.

A very simple method is thus recommended. Take a piece about the size of a hazlenut, put it into a pint of milk the night before you intend to make cheese, and it will dissolve. Add it to the milk at the time the rennet is put in. This quantity will colour a cheese of twenty pounds weight.—PARKINSON.

In making cheese the milk is put into a large tub, and this, as soon after being obtained from the cows as possible. If there is a sufficient number of cows on the farm to produce one cheese at a milking, the process is performed immediately. The milk, after being strained through a sieve, is put into a vat, and while yet warm, a table-spoonful or two of the rennet (or a sufficiency) is mixed with it, after which the coagulation soon takes place.

But if there are not a sufficient number of cows to make a cheese each time they are milked, the milk as it is brought from the cows, is put into milk vessels, until as much is collected as will form a cheese. When the cheese is ready to be made, the cream is skimmed off, and as much of the milk is heated separately, as, when added to the mass again, will raise it to about 90°. The cream which has been separated is then either mixed with this heated milk, and so liquefied and dissolved in it, or it is not incorporated with the general mass until the heated milk has been added.

The curd being fully formed, is cut in various directions with the cheese-knife, so as to permit the whey to exude; the whey is then taken out in flat dishes, the curd at the same time undergoing a gentle pressure. By the operation of the cheese-knife, the curd is then cut into small pieces, put into a sieve or vat with holes, and then repeatedly cut, pressed by the hand and broken, until it ceases to give off any serous matter. It is last of all cut very fine by the cheese-knife, and a quantity of salt, in the proportion of half an ounce to a pound of cheese, being mixed with it, it is wrapped in a piece of cloth, and then placed in a small wooden vessel, with circular holes at the sides and bottom, and placed in the cheese-press. This is the process of cheese making, as detailed in the Elements of Agriculture. Some others, however, recommend that when the curd is sufficiently drained, and broken with the hand as small as possible, that the salt, which should be of the most superior kind, be scattered over the curd, and intimately mixed with it; the proportion, however, has not been correctly ascertained, and is regulated by experience.

The pressing process is one of great nicety, as the period for which the cheese should remain in the press is, in a great measure, dependent upon the nature of the cheese, and the degree of previous manipulation which it had undergone. In some of the finer and richer cheeses, the pressure is very slight, and in some few cases, the cheese press is entirely dispensed with. But in ordinary cases, the cheese being wrapped in a cloth, and put into its vat with a board above it to fit the vat, remains in the press from one to two hours. It is then taken out, broken again by the hand, wrapped in fresh cloth, and replaced in the cheese-vat; and sometimes it is not broken but merely reversed. It may then be taken out every five or six hours and the cloth changed. After being pressed in this manner for two or three days, the operation will be complete. The cheese may then be kept in a warm place until dry, and ultimately placed in the store-room for preservation.

The management of some is, when the making and salting is completed, a cloth is to be spread over the cheese vat, the broken curd is to be neatly packed into it, the whole well covered by a clean cloth. A smooth round board, as before described, is then laid over the vat, the vat being usually filled to the height of about an inch above the brine, the object of which is to prevent the curd sinking below it, when the whey is squeezed out. It is then placed in the press, and as it is essential that every particle of whey should be expressed, iron skewers, about eighteen inches in length, prepared for the purpose, are thrust into the cheese through the holes in the lower part of the vat, by which means the passage of the whey is greatly facilitated. In two hours the cheese is taken out, and immediately placed in a vessel of warm or hot whey, (not boiling,) where it remains for an hour or two for the purpose of hardening the surface or skin of the cheese.

When the cheese has remained for a sufficient time in the warm whey, it is removed, carefully wiped until dry with a towel, and when cold, neatly enveloped in a fine cloth, and again submitted to the pressing process for six or eight hours. It is now turned a second time, taken to the salting-room, where it is rubbed on each side with salt—after which it is wrapped in a dry cloth of a much finer texture than either of the cloths before used, and is again pressed for twelve or fourteen hours. If any edges remain they are paired off; the cheese is then placed upon a cheese shelf, where it is to be turned every day. In the salting-room, cheese, says Parkinson, should be kept warm until it has had a sweat, or has become regularly dry or somewhat stiff—as it is a proper degree of warmth that ripens cheese, improves its colour, and causes it when cut to have a flaxy appearance, which is the surest sign of superior excellence.

The management of the cheese-room requires much care and attention. After the cheeses have passed through the different processes, and the salting and drying are completed, they are deposited in the cheese or store-room, which should be airy and dry. The hard and soft cheeses ought not to be kept in the same room. The dairyman should bear in mind that there is no possible remedy for the defects of previous management; for if the rennet be impure, the whey not wholly expressed, or the salting imperfectly or insufficiently performed, the cheese will prove of inferior quality. When a cheese has a disposition to heave or swell, or run out at the sides, it may be regarded as an indication that the whey had been imperfectly separated.*

New cheese to fit it for market requires to be well dried; when taken out of the mould they are to be laid on a shelf, and the surface of each alternately exposed to the air. This laborious operation was formerly performed by hand, but machines answering every desirable purpose have been invented, and may be found described in the chapter of Implements.

Great variations take place in the manner of performing the operations of the cheese manufacture—and certain districts are distinguished by their peculiarities of practice. The richness and flavour of cheese, very much depend upon the quantity of cream which the milk contains. In some places, most celebrated for rich cheese, the cream of one milking is skimmed off and mixed with the entire milk of the subsequent milking. In this way the milk which produces cheese has its own cream and that also of a previous milking.

We learn from the Transactions of the Highland Agricultural Society of Scotland,† that the flavour of an old cheese may be communicated to a new one of whatever species, by the insertion of some portions being intermixed with it. This is done by extracting small pieces with the sample-scoop from each cheese, and interchanging them, by which means the new one, if well covered up from the air, will, in a few weeks, become thoroughly impregnated with the mould, and with a flavour hardly to be distinguished from the old one. The cheeses selected must be dry, and the blue mould should be free from any portion of a more decayed appearance.

* In order to prevent or stop this heaving, the cheese must be laid in a moderately cool and dry place, and be turned regularly every day. It should be pricked on both sides, in several places, particularly where it is most elevated, by thrusting a skewer into it, by which a passage is given to the confined air. This pricking, with a cheese-skewer or awl, which should be repeated as often as necessary, will not altogether prevent the swelling; yet, by giving vent to the confined air, it renders it less considerable—and the cavities of the cheese will neither be so disagreeable, nor consequently so unsightly or unpleasant to the eye. LOUDON says that *hard and spoiled cheese may be restored* as follows:—Take four ounces of pearl-ash and pour sweet white wine over it, until the mixture ceases to effervesce. Filter the solution, dip into it clean linen cloths, cover the cheese with them, and put the whole into a cool place or dry cellar. Repeat this process every day, at the same time turning the cheese, and, if necessary, continue it for several weeks. Thus the hardest and most insipid cheese, it is affirmed, has frequently recovered its former flavour.

† Vol. iii. N. S., p. 232.

To enumerate all the different varieties or sorts of cheese, and other preparations made from milk, would form quite a catalogue; it is an article in universal esteem; but there are different kinds in almost every district, according to the mode of its preparation. Having already occupied a large space of the work with remarks relative to the process of cheese making, we have only room to refer briefly to a few of the foreign cheeses of superior excellence.

The *Cheshire cheese* is in the highest repute, and eagerly sought after. The making of this cheese is carried to the greatest perfection—it is made from the whole of the milk and cream, the morning's milk being mixed with that of the preceding evening, previously warmed. The greatest pains are taken to extract every particle of whey.

The *Stilton cheese*, proverbial for its richness and flavour, is made by putting the night's cream, without any portion of the milk, to the milk of the following morning, with the rennet; but those who wish to make it very fine, add a still greater quantity of cream, and of course the richness of the cheese depends upon the amount which is used. When the curd is come it is not broken, as is usual with other cheese, but is taken out whole and put into a sieve to drain gradually, when it is pressed with weights until entirely freed from the whey; when it becomes dry by the process of pressing, it is put, with a clean cloth, into a vat or box made to fit it, the outer coat being first well salted. When it has acquired firmness enough to be removed from this mould, it is to be placed on a dry board, tightly bound about by a fine cloth, which is to be changed daily, to prevent cracks; but when this danger ceases, the use of the cloth is dispensed with, and the cheese requires no further attention or care than daily turning upside down and brushed for two or three months. Sometimes they are made in a net, which gives them the form of an acorn; but this mode is not preferred. It generally remains two years before being brought to market.

Of the *Parmesan cheese* almost every person has some knowledge; it is made in various parts of Lombardy, and particularly in the Dutchy of Parma; it is prepared much in the same manner as the Cheshire, and the best American cheeses. It is, however, made of skim-milk, the curd hardened by heat, by being placed in a suitable vessel over a moderate fire, well salted, thoroughly pressed, dried, long kept, and rich in flavour from the rich herbage of the meadows of the Po, along the borders of which the cows are pastured.

Soft and rich cheeses are not intended to be kept long—hard and dry cheeses are adapted to be kept and stored for years.

Of the first kind are all cream cheeses, and those soft cheeses which are sold as soon as made, and which if kept too long become soft and putrid. The Cheshire, and similar cheeses, are intended for longer keeping—and cheeses made in very many American dairies, have been known to keep in the most perfect manner for years. The great point is to have them perfectly cleared of whey, and properly and sufficiently salted.

XVII.—REARING AND FEEDING OF ANIMALS.

1. THE HORSE.

In the genus *Equus*, naturalists comprehend six species or animals nearly allied:—1. *Equus caballus*, the horse. 2. *Equus nemionus*, the dziggithai. 3. *Equus asinus*, the ass. 4. *Equus quagga*, the quagga. 5. *Equus zebra*, the mountain zebra. 6. *Equus burchellii*, the zebra of the plains. Of the species enumerated, those which have been domesticated and brought under the dominion of man, are the *Equus caballus* and *Equus asinus*, and a hybrid produced by these two species.

But for the domestication and services of the horse, we should have yet been far behind in civilization, and without him our luxuries and comforts would have been vastly circumscribed. By his aid the labour of agriculture is greatly lessened —commercial intercourse facilitated—and the transportation of men and merchandise, as well as the produce of the earth, effected with rapidity even to distant parts. The form of the horse is the most perfect and elegant of all other animals. This perfection of form and pliability of physical organization, adapts him for speed; while his extreme docility of disposition, renders him a willing and obedient servant to man.* The horse is vastly modified in his form and character by the physical condition of the countries in which he is naturalized.

Asia is supposed to be the native country of the horse—in the extensive plains of that country, he is found at the present day, roving in unrestrained freedom. In the vast and fertile plains of South America, immense troops of wild horses are to be found, sprung from individuals taken to that country by the Spaniards. They have increased so astonishingly, that they are to be met with in troops of many thousands, and it is extremely hazardous for travellers to pass through the districts where they herd. The wild horses of America are generally of a chestnut-bay and a sorrel colour—some few are black. At what period the horse was first domesticated and brought into the service of man, is not known. It was probably coeval with the earliest improved state of society. The first instance of horses being mentioned in the sacred scriptures is in Genesis,

* Information for the People, p. 81.

chap. xlvii. 17th verse, "and Joseph gave them (the Egyptians) bread in exchange for horses." This was B. C. 1702, and is the first and earliest record we have. We are subsequently informed that they multiplied with great rapidity, for when Joseph removed his father's remains from Egypt to Canaan, (B. C. 1670,) there "went up with him both chariots and horsemen;" and we find that in a century and a half after this period, that the horse constituted the principal strength of the Egyptian army.

The varieties of the domestic horse are numerous. Operated on by climate and other circumstances, he assumes that form best adapted to his locality. If reared in a country where the plains abound in rich herbage, his form becomes large; but if fed in an elevated country, or so far north that the herbage is scanty, his size and form, will, as a necessary consequence, vary with the circumstances in which he is placed. No contrast between animals of the same species can be greater or more striking, than that between the horse of the mountains and the horse of the plains. Yet all this great diversity is produced by a difference in the supplies of food, as influenced by the effects of situation. Nor is this peculiar to the horse—the domestic ox and the sheep are subject to the same law, and in a no less remarkable degree. These animals are essential to the subsistence of the human race, and, by a beneficent provision of Nature, they are formed to adapt themselves to the circumstances in which they are placed.*

No record is extant of the precise period when the horse was first introduced into Europe. The frequent wars between the Greeks and Persians, was probably the means of introducing the horse into Greece, as we read that Xerxes, who invaded that country, had eighty thousand horses, principally chosen stallions. From thence it was a very easy matter for them to spread over the continent of Europe. The first Arabian horse introduced into England was during the reign of James I.

The Spanish horses are still held in high estimation. The invasion of that country by the Moors in 1710, was the means of introducing the most excellent breeds of oriental blood; and during the continuance of the conquerors there for several centuries, an improved race was produced. Notwithstanding the unhappy state of that once prosperous country, the good qualities of the horse are not wholly debased; for at the present day the best Spanish horses are preferred by many competent horsemen to the barbs. The *Spanish Genet* is celebrated for its

* Professor Low's Elements.

elegance and sprightliness. Horses reared in Upper Andalusia are considered the most valuable—they rank next to the *Persian* horses, which are considered next in value to the *Arabian.*

In France, a great variety of breeds are to be found; the most valuable of which is a noble race of draught or farm horses, unsurpassed by those of any other country. The breed of horses is improving—more attention being paid of late years to the improvement of stock than heretofore. NAPOLEON gave the first efficient impulse by importing more than two hundred fine Arabian stallions, which were distributed throughout the empire.

The *Flemish horses* are not highly valued. They usually have large heavy heads and necks; large and flat feet, and their feet subject to swellings and watery humours. There must, we think, be some good animals among them. *Holland* furnishes a race of horses suited for light work. Germany is not destitute of good horses, though the most of the native breeds are heavy and ill-formed. Their breeds are much improved by crosses with the Asiatic and Arabian breeds. The *Polish horses* are of middle size, hardy, strong, and useful, and in many points bear a strong resemblance to the Canadian or French horse. The *Russian horse* is chiefly regarded for his capability of enduring great fatigue. They are small and hardy, and but lightly prized without the limits of their native country. The *Swedish horse* is low and small, and the *Norway breed* may be comprehended under the same description—but they are strong, hardy and active. *Denmark*, *Holstein*, and *Oldenburg*, boast of a great variety, some highly esteemed for cavalry service, carriage use, and heavy draught.

The true Arabian horse is considered by many good and well qualified judges, as superior to all others for symmetry of form, and grace and beauty of its movements. In their native country they are nurtured with the greatest possible care and attention. Indeed, they are almost idolized by their owners. The care which the Arabs observe to preserve the blood of their favourites pure and unmixed, is as commendable as it is proverbial. None but stallions of the finest form and the purest blood have access to their mares, and even that is not permitted except in the presence of a professional witness, (public officer,) who attests the fact, records the name, and signs the pedigree of each.

In England there are several varieties, each of which is known by its distinctive name.—1. The *race-horse*, which has descended nearly in a direct line from the Arabian, the Persian and the Barb. 2. The *hunter*, derived from horses of entire blood, or but removed a shade or so from it. In propagating this breed, the mares are selected with regard to their purity of blood, size, and other good qualities, and the stallions are of the most powerful kind. This breed, therefore, combines the speed of the Arabian, with the durability of the native horse. 3. The *improved hackney* is derived like the former, from a judicious mixture of the blood breed with the native, the latter preponderating. 4. *The old English road horse*—this most valuable breed, simply because it is not so beautiful to the eye as the others, has become almost extinct. This horse is admirably adapted for farm work, and we are pleased to learn that some intelligent agriculturists are making efforts to revive the race. 5. The *black horse,* generally met with in the midland counties, is a noble animal. 6. The *Cleaveland bays,* a cross with the race-horse, have degenerated of late years. They were formerly held in great esteem. It is said by some, that in activity and hardiness, these horses have no superiors. They are better calculated for slow draught than any other purpose. 7. The *Suffolk punch* is held in high esteem by farmers, as it is a very useful animal in rural labour—superior, from the quickness of their step and their hardiness, to all other horses at the plough. 8. The *Clydesdale* horse is probably equal to any other for farm work, on which account it is highly esteemed in Scotland and the north of England. They are a strong, active, hardy race, of the middle size, remarkably steady, true pullers, of sound constitution, and well adapted to all the purposes of husbandry. 9. The *Welch horse,* according to CULLY, from whom the above epitome is gathered, bears a near resemblance, in point of size and hardiness, to the best of the native breed of the highlands of Scotland, and other hilly countries of the north of Europe. 10. The *Galloway* breed, formerly celebrated, is now nearly extinct, being found unsuitable for agricultural purposes.

Besides the varieties enumerated above, there are numerous others of the *inferior description of saddle-horse.* The British varieties of war or cavalry horse, and of carriage or cart horse, are considered by CULLY, MARSHALL, LORD CHESTERFIELD and others, to have been derived from the German and Flemish breeds, meliorated by judicious culture, with a slight mixture of Arabian and Spanish blood.

There are numerous varieties of the horse in the United States, of all grades, from the most superior, in point of form, symmetry, beauty of carriage, docility and value, to the most indifferent kinds. We look back with astonishment at the indifference manifest a few years since, by many, even among the best farmers of that day, respecting the qualities of farm stock. But that has passed—and a most commendable spirit of improvement has diffused itself throughout our whole country. No pains or expense have been spared by gentlemen of intelligence and enterprise, to procure animals—not of the horse family alone—but of all other descriptions, of the purest blood. Imported blood stock may now be found in every section of our country, and native animals in abundance, nearly, if not in many instances, equal to them in point of excellence and value. This mighty change has been wrought in a few years.

Although we have many different breeds of horses, all of them possessing their peculiar valuable properties, yet they are not distinguished or known from each other by peculiar names, as distinct breeds, as is the case in Europe. We have the race-horse—the saddle-horse—the coach-horse—the family-horse—the road or stage-horse—the cart or draught-horse—and the farm-horse. Those used in transportation of goods, called team, and sometimes wagon-horses, are generally heavy, fine spirited, noble looking animals, regular in their gait, steady in their pull, performing their daily task with apparent cheerfulness and good will.

The improved breeds in the United States, are derived principally from the Turkish horse, a regular descendant from the original Arab, crossed by the best Persian blood. Several of our consuls, residing on the borders of the Mediterranean, deserve great credit for the pains they have taken to send over to their native country horses of the best breeds and the purest blood.

With the improvements already noticed, a great change has taken place in the *rearing and subsequent management of horses.* The former practice was not only seriously defective, but absolutely injurious. The mode of breaking a young horse was not merely absurd, hurtful to him, and dangerous to the person performing the operation of taming, but *cruel* in the extreme. Frequently, without being accustomed to the bridle, or any incumbrance, he was mounted. If he refused to comply with the wishes of the rider, the young horse, ignorant and alarmed, was unmercifully beaten—he was jerked by the head backwards and forwards, until, becoming wild with fright, he dashed off, and frequently unseated his rider at a single bound. We have known many instances in which, at the outset, the animal has gone off kindly—and the injudicious rider continued the exercise until the horse was completely jaded down and dispirited. A horse if taken early can be rendered perfectly tractable and docile by tender and kind treatment. The proper method of breaking will be hereafter noticed.

The following observations respecting the form—rearing and feeding—with copious remarks as to the general management of the horse, are taken from Professor Low's work. It is more full and comprehensive than any we have heretofore met with, and so brief withal, that we cannot abridge it to advantage.

1. *Form.*—An examination of the form of the horse requires a cursory one of his anatomical structure.

The bones of an animal form, it may be said, the foundation on which is erected the edifice of the living machine. They mainly give to it its form and proportions. Their various parts, connected by flexible ligaments, are capable of all the varieties of motion fitted to the condition of the animal.

Motion is given to the bones by means of muscles or fleshy fibre: but the flesh of animals is not a mere stratum covering the bones, as some might suppose. Every muscle is a distinct organ, consisting of innumerable parallel fibres, forming, as it were, a fleshy band, stretching from bone to bone, or from muscle to muscle, and each serving its peculiar function.

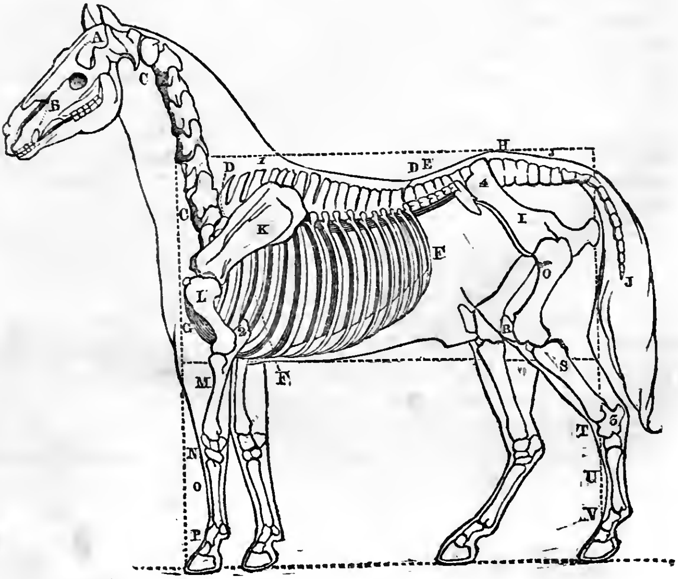
These muscles are of vast power when under the influence of the vital principle. By contracting, they give motion to the bones and other parts. Each muscle consists of long threads or fibres, seemingly bound together by meshwork. These fibres, in so far as the eye, assisted by very powerful glasses, can discover, are resolvable into minuter filaments. A number of these filaments may be said to form a fibre; a number of these fibres to form a fasciculus or bundle of fibres; and a number of fasciculi to form a muscle.

Muscles assume a variety of form suited to their peculiar functions. Sometimes they are flat, extending over a considerable space, and often they form a fleshy band, swelling out in the centre, and becoming small and tendinous at the points of their attachment to the bones.

Not only is a class of muscles employed in giving motion to the bones, but a numerous class is employed within the body in giving motion to the organs of nutrition, as the heart and the stomach. Anatomists enumerate in all about 400 muscles, a number wonderfully small when we consider their functions, and the infinite variety of motion in the animal; for, from the motions of the limbs to the expression of the face and modulation of the voice, all is moved by this machinery of surpassing beauty and simplicity.

The bones, although harder than the muscular structure, are, like it, the parts of a living machine, furnished with their bloodvessels and nerves. They give to the animal its peculiar form, and, acted upon by the muscles, its power of progression.

The following figure represents the connection of the principal bones of the horse:—



C C, Cervical vertebræ.
D D, Dorsal vertebræ.
E E, Lumbar vertebræ.
A, Bones of the cranium.
B, Bones of the face.
H, Sacrum, or rump-bone.
J J, Bones of the tail.
E F, Ribs.
G, Sternum, or breast-bone.
I, Os innominatum.
Q, Os femoris, thigh-bone or haunch-bone.
S, Bones of the leg.
R, Patella, or stifle-bone.
T, Tarsal bones, or bones of the hock.
U, Metatarsal bones of the hind-leg.
V, Phalangeal bones, or bones of fetlock, foot, &c.
K, Scapula, or shoulder-blade.
L, Humerus.
M, Fore-arm.
N, Carpal Bones.
O, Metacarpal bones.
P, Phalangeal bones—
1. Withers.
2. The elbow.
3. Point of the hock.
4. Hip-bone.

The series of bones to which the others may be regarded as attached, is the vertebral or spinal column. This, in man, is erect, forming what is termed the back-bone. It is a pillar of bones, flexible and of great strength, serving to support the head and chest. These bones or vertebræ are jointed or articulated together, with a certain power of motion, and firmly bound by strong cartilage. Each vertebra has a cavity passing through its centre, so that, when all are united together, there is a continued canal passing along the whole column. It is within this canal that the continuation of the medullary part of the brain, or spinal marrow, is enclosed. Radiating from this, and passing through foramina or holes in the column, are nerves destined to give sensation and motion to the muscles and other organs.

In man the number of vertebræ is 24, in the horse 30; in man the column is erect, in the horse it is horizontal, to suit the position of a quadruped.

Of the vertebræ, those peculiar to the neck are termed cervical; those belonging to the back, and from which the ribs arise, dorsal; those belonging to the loins, lumbar. In man there are 7 cervical, 12 dorsal, and 5 lumbar vertebræ; in the horse there are 7 cervical, 18 dorsal, and 5 lumbar vertebræ.

These vertebræ have each projections termed processes, which are designed for the attachment of muscles, and of which the upright are termed spinous processes. In the horse, the spinous processes next the neck are very large, forming what are called *withers.* To them are attached muscles and ligaments which support and give motion to the head and neck; and large withers are connected with the power of active motion in the horse.

Jointed or articulated to the first of the cervical vertebræ is the head, containing the brain and the principal organs of sense. The bones of the head are divided into two classes, those of the cranium or skull, and those of the face. The bones of the cranium are distinct pieces, firmly united, and many of them dovetailed into each other, and forming a cavity fitted in the happiest manner for the protection of the vital organ within. The manner in which the cranium is articulated to the upper vertebra, is analogous to that in which the vertebræ themselves are united together. The cranium may be said to be itself a vertebra, its parts being merely expanded and enlarged so as to form a cavity for containing the brain.

In man the cranium and face are round: in the horse they are elongated, in order that the mouth may collect food. The head in man is nicely poised upon the summit of a column: in the horse, in order that it may reach the ground, it is pendant. In the horse, its great weight is supported by powerful muscles, and by a strong ligament extending from the head to the spine. It is for the better attachment of this ligament and muscles, that the withers of the horse are large: in man withers are not required.

The prehensile organ of the horse being the mouth, and not as in man the hands, the length of the cervical vertebræ must be so much greater in the horse than in man, that he may be able to reach the ground and collect his food. Although the number of cervical vertebræ in the horse is the same as in man, their length in the horse is much greater.

The spinal column becomes larger towards the base, when it gradually diminishes. This portion of it forms what is termed the sacrum: the bones of it are not jointed, but united so as to form one bone. The vertebral canal is continued into the sacrum, and sends forth nerves to the lower extremities. In man the sacrum is terminated by 4 or 5 little bones united together: in the horse these bones extend to a greater length, forming the caudal vertebræ or tail.

Rising from the several dorsal vertebræ are the ribs. These bones are flat, bent, and elastic, and terminate in cartilage. Some of them are united directly to the sternum or breast-bone; these are termed true or sternal ribs. Some are not united directly to the sternum; these are termed false or asternal ribs. In man the number of dorsal vertebræ and consequently of ribs, is 12 on each side. In the horse the number of dorsal vertebræ, and the number of ribs accordingly on each side, is 18, of which 9 are true ribs and joined to the sternum, and 9 asternal ribs. The other bones connected with the spinal column are those of the pelvis, to which is attached the bone of the thigh. Connected with the spinal column also by muscles, is the scapula or shoulder-blade, to which is attached the humerus.

The pelvis is at the lower part of the spinal column in man, and at the hinder part in the horse. It is a large irregular-shaped cavity, formed by the ossa innominata and other bones. It is within this cavity that the fœtus is developed and nourished. A prominent bone of the pelvis is the ilium or hip-bone.

Into a cavity of the os innominatum on each side is inserted the os femoris or thigh-bone, which is the largest bone of the body. The thigh in man is altogether detached from the trunk; in the horse it forms apparently a part of it. This is required by the different position of the animal, and the bone has sufficient facility of motion in the position in which it is placed. In man it stands vertical; in the horse it is bent, which prevents the animal from being raised too high above the ground. In this position, too, he has a greater power of progression. When he moves the limb backwards it describes a large arch of a circle. Now, were the thigh placed perpendicular to the ground, it will appear from the figure that, when stretched backwards, it would describe a smaller arch of a circle. Its length, therefore, combined with its bent position, conduces to the vast power of progression of the animal: and the comparative power of motion in horses is very much dependent upon the length of this part. This greater length of the thigh-bone, again, is indicated to the eye by the distance from the hip-bone backwards, forming what are termed the hind-quarters. Jockeys, accordingly, always look to the size of the quarters as connected with the rapid power of progression of the horse.

Next in order are the bones of the leg, consisting first of the patella or stifle bone, corresponding with the pan of the knee in man, and next of the two bones, the tibia and fibula, united in the horse, and forming the leg properly so called, and corresponding with the leg in man. The leg of the horse should be long in proportion to the lower parts of the limb.

The further bones of the limb correspond with the bones of the heel, the foot, and the toes of man. The bones of the heel in man are termed the tarsal bones; of the foot, the metatarsal bones; and of the toes, the phalangeal bones. In man the tarsal bones are in number 7, the metatarsal 5, and the phalangeal 14. In the horse, the bones corresponding to the tarsal, metatarsal, and phalangeal bones, are likewise, as in man, many; and this number of bones adds to the flexibility and elasticity of the limb.

Man, however, standing erect, requires a large pediment of support. The bones of the foot therefore are made to rest upon the ground. But the horse, having four limbs of support, does not require this large pediment. The metatarsal bones of the horse are therefore extended, in order to give length to the limb. The phalangeal bones form the fetlock and other parts, giving to them flexibility and elasticity; and the lowermost only of the phalangeal bones are brought into contact with the ground. These last are not separate as in man, but together, and defended with horn. The horse, therefore, may be said to stand on his toes; and if any person will attempt to walk on all-fours, he will find that the toes will touch the ground, while the bones of the foot will be raised up.

The bone of the horse termed the point of the hock, corresponds with the great bone of the heel in man. To this is attached powerful muscles; and the size of this bone, therefore, as giving space to the attachment of muscles, is connected with good action in the horse, and is therefore one of the points looked at by jockeys.

The bones of the other extremity of the horse correspond with the arm, the fore-arm, the wrist, the hand, and the fingers in man. In man the hand forms the prehensile organ, and a great flexibility is given to the different bones which form it. In the horse these bones form the limbs of support. They are not designed to seize objects, but to support the weight of the animal before,—to be raised from the ground when he pushes himself forward by the extension of the limbs behind, and to receive his weight when he again reaches the ground.

The scapula or shoulder-blade is in the horse, as in man, a large flat triangular bone, placed upon the ribs, and connected by means of muscles with the head, the ribs, and the spine. In man, the two scapulæ are kept from approaching each other by the clavicle or collar-bone. From the form and position of the horse, this approximation cannot take place; and there is therefore no collar-bone in the horse.

Into a cavity of the scapula is jointed on each side the humerus. But the humerus, or arm from the shoulder to the elbow, is in man detached as it were from the body; while in the horse it seems to form a part of it; and in this position it has sufficient power of motion. It is bent, as will be seen from the figure,—an admirable and necessary provision to lessen the shocks which the animal receives on bringing his limbs to the ground; for by this flexure they act the part of a spring. Were these bones vertical, the limb would be shattered when it struck the ground.

The shoulder of the horse should be oblique, and the humerus relatively short. The obliquity of the shoulder is a point connected with action in the horse; and the reason why the humerus should not be long will appear from the function which it has to perform. When the animal moves the limb forward to raise it from the ground, the humerus has to describe an arch of a circle; but the muscular power being sufficient, the shorter radius describes an equal arch with a longer.

The next of the bones are two, the radius and ulna united together in the horse, forming the fore-arm in man, and what is termed the fore-arm in the horse. The termination of the ulna, corresponding with the elbow, forms an important point of the horse, because to it are attached powerful muscles for the movement of the limb. Jockeys accordingly look with attention to the size of the elbow of the horse.

The remaining bones of the limb correspond with the bones of the wrist, the hand, and the fingers, in man, termed respectively the carpal, metacarpal, and the phalangeal bones.

The carpal bones of the horse are commonly called the bones of the knee; but these bones do not correspond with the knee, but with the wrist, of the human body. They are 8 in number in the horse as well as in man. In man, they give flexibility to the hand; in the horse, they give flexibility to the limb of support.

The next bones are the metacarpal bones. These correspond with the bones of the hand in man: but in man they form a part of a prehensile organ; in the horse they are extended in order to give length to the limb.

The bones of the fetlock and foot correspond with the phalangeal bones, or bones of the finger in man. They are distinct in man; they are together in the horse, and, touching the ground at their extremities, are defended by horn.

The horse, abstracted from his neck, and viewed in profile, is contained nearly within a square, of which the body forms one half and the limbs form one half. In this respect the form of the horse differs greatly from that of the ox, the body and limbs of the ox, abstracted from the neck, being included in a rectangle, in the manner to be afterwards shown, and the body forming a greater proportion of the rectangle than the limbs. This circumstance would alone account for the greater power of progression of the horse than the ox.

In the horse, while sufficient space must be given in the size of the body to the respiratory and nutritive organs, this space must not be too great, because then the body will bear too large a proportion to the limbs for the purpose of active motion. In the ox the larger the proportion of the fleshy matter of the body to the limbs the better.

In the case both of the horse and the ox, the large expanded chest indicates a disposition to fatten; but if this be carried too far in the horse, he will be incapable of active motion. Such a form may suit the dray-horse, when a large force is to be thrown upon the collar; but would be unsuited to those cases in which we require the power of active motion, or, in technical language, action.

In a horse where speed alone is required, the chest must not be too broad; but in a horse in which we require active motion, combined with endurance, there should be a sufficient breadth of chest; and a medium, therefore, is what is desired in the hackney and the hunter. In the farm-horse, the chest should be broad; because in the farm-horse we require the power of draught, and not of speed.

The chest of the horse behind the shoulders should be deep; his back, when we look for strength without sacrificing this to mere speed, should be short; the ribs should approach near to the pelvis, as indicating strength, though, if speed alone be required, this point may be sacrificed. The fore-arm and hind-leg, to the joints, should be muscular, and below the joints tendinous. The trunk should be barrel-shaped, but somewhat elliptical, and gently enlarging from the breast backwards.

2. *Rearing and feeding.*—In the breeding of the horse, it is important that the parent of either sex be free from disease. It is well known to all breeders, that the diseases of the parents, as well as their good properties, are transferred to their offspring. In breeding, attention should be paid to the female as well as to the male parent, else disappointment may result with respect to the form and properties of the progeny.

A mare is capable of receiving the male at an early age; but it is an error to commence breeding from any mare before strength has been acquired, and her form developed; and this will rarely be sooner than at three or four years of age.

The mare comes into season in spring: she goes with young about eleven months, although with an irregularity, even to the extent of several weeks on either side of that period. The most convenient time for her receiving the male is in May, that she may foal in April, when the herbage begins to spring. From the time she receives the male till that of foaling, the farm-mare may be kept at her usual work. She will give notice of the period of foaling, by the extension of the udder, and other symptoms, and she may then be released from work.

In general, little difficulty or danger attends the parturition of the mare. She rarely requires assistance; but, should difficulty really arise, from the particular position of the fœtus, it is well, if possible, to obtain the assistance of a veterinary surgeon, lest the mare be injured by unskilful and violent means.

As soon as the mare has foaled, she should be placed with her young, either in a house, or, what is better, in a pasture-close, with a shed to which she may go at all times. It is necessary, at this period, to supply her with nourishing food.

It is better that the mother be kept in a field, and permitted to suckle the young undisturbed. But yet she may be put, without danger or injury, to moderate work within a short time after foaling. For a time, the foal should be shut up in a house during the hours of work, which then should not be too long; but, after the colt has acquired a little strength, it may be permitted to follow the mother even when at work in the fields. Many, indeed, do not approve of this practice, on account of the chance of accidents to the foal. But accidents seldom occur, and the foal has an opportunity of taking milk more frequently, is the better for the exercise, and becomes used to the objects around it.

In nine days or more after foaling, the mare will be again in season, and may receive the male. In six months the foal is to be weaned, which is done merely by separating it from the dam. It is then best put in a field: the mother is then put to her ordinary work, and treated as usual.

At the time of weaning, and during all the period of its growth, the foal should be liberally fed. Bruised oats, meal, or any farinaceous food, may be given to it. It is not necessary or proper that it be pampered; but it is important to its growth and vigour, that it be supplied with sufficient food.

The male foal intended for agricultural purposes must be castrated; and the best period for performing the operation is at the age of twelve months. Some do it before weaning, but it is better that it be delayed till the masculine form of the animal has been more developed.

If the colt be intended for the saddle, it is well that from this period it be accustomed to gentle handling by the person who feeds it, for this is a mean of rendering it docile and good-tempered. But however this be, nothing but kindness is to be shown to these young creatures, and any thing like rough treatment is to be carefully avoided.

The colts are kept in their pastures during the summer, and when these fail before winter, the animals may be put into a stable or yard with sheds, and plentifully littered with straw, like the young oxen upon the farm. They may receive straw for half the winter, and hay towards spring when the straw becomes dry and unpalatable; and turnips, or any green food, should be supplied to them freely throughout the winter. It is a great error to starve colts, for this injures their growth and vigour in a degree far beyond the value of the increased food required. Although they may be confined in a yard in the manner described, it is greatly better, where convenience allows, that they have a piece of ground on which they may run in winter. This is favourable, in an eminent degree, to their health, and the state of their feet.

But, however the colts are managed in winter, as early in spring as the pastures will allow, they are to be turned out to graze in the fields, where they are to be kept during summer; and in the following winter put again into the yards or paddock, and treated in the same manner as before.

And they are to be treated in a similar manner in the following summer and winter; after which, namely, when three years old, they will be in a condition to be broken in, and, if draught-horses, employed in the work of the farm. They may be taken up for training even in the third autumn of their age, though at this period the work should be very gentle.

A farm-horse usually receives little training, though it is better that a partial training, as in the case of the horse intended for the saddle, be given. But whether this be done or not, the colt should have a bridle with an easy bit put upon him for a few days, and allowed to champ it for an hour or two at a time in the stall. The harness being then put upon him by degrees, he may be trained to the different labours required of him. In general, the farm-horse, working with his fellows, is easily brought to be obedient.

But when a farm-horse is four or five years old before he is put to work, or if he is a stallion, or if he shows any vice, a little more care may be proper, and a partial training, as if he were intended for the saddle, given him. And if he is a valuable horse, and fit also for the saddle and the carriage, the more complete the training given to him the better.

The art of training the horse for the saddle is now well understood, and the rude and violent practices of former times are generally abandoned by all who have any competent knowledge of the subject. In every case, gentleness and kind treatment are to be strictly observed in the management of the colt. He is first to be taught his duties, and corrected afterwards only when necessary to enforce submission. Fear, in the training of the horse, is that feeling with which he is soon endued, that he is under the dominion of a more powerful agent, whose will he cannot resist. Implicit submission is to be enforced, gently in so far as instruction is concerned, but by calling into action the principle of fear, when this is required to produce obedience. Decision and firmness, with a resolution to be obeyed, after the horse has been fairly taught the duties that are required of him, are altogether distinct from violence and cruelty. Nothing is so destructive to the temper of a horse as useless coercion, and all the defects of temper, when they exist in the young horse, arise, in the great majority of cases, from injurious treatment. But we are here chiefly to consider the management of the horse as an animal of labour.

The farm-horse demands, neither in the training nor in the feeding, that nicety which is required in the case of the horse designed for rapid motion or irregular labour. He requires merely to be maintained in good order, never to be worked beyond his power, and never to be allowed to fall, in condition, below the work which he is to perform.

The stable for the farm-horse, as for every other, should be spacious and well ventilated. It is a great error to suppose that horses require a close, warm stable, to preserve them in health. To keep them fully sheltered, and free from the action of any cold current, is all that is requisite. The horse is well suited to bear an equal temperature, but not sudden changes produced by artificial means. Farm-horses regularly worked have been known to be kept throughout the coldest winters in mere sheds, not only without injury, but with greater benefit to their health than if they had been closely confined.

Next to ventilation in importance, is cleanliness of the stable. No filth should be suffered to accumulate, but every day the stable should be cleaned out, with the same attention for the farm as for the saddle-horse. In the farm-horse stable, every ploughman should have a small fork, a curry-comb, a brush, a mane-comb, and a foot-picker.

Light should be admitted into every stable, to a certain extent. But in the case of farm-horses, which are only in the stable during the hours of rest and feeding, less light is necessary than in the case of the saddle-horse, which passes a great part of his time within doors. The light required for the farm-horse stable is that which is sufficient to allow the workmen to perform their duties in the day-time. Sometimes there is a room adjoining the stable for holding the harness, but it is perfectly convenient and sufficient in practice, to have the simple furniture of the farm-horse hung on pins in the wall behind each pair of horses.

The food of the horse in this country consists of herbage, or green forage, as clovers and sainfoin; of dried forage, as hay and straw; of various farinaceous substances, as oats, barley, peas, and beans; and of the succulent roots of plants, as the potato, the turnip, the carrot, the parsnep, and the beet. Of the grains given to the horse, the most generally employed in this country, and that which is regarded as well adapted to his strength and spirit, is the oat.

The oat is, for the most part, given to the horse without any preparation, though it is sometimes bruised, which is always beneficial, by rendering it more easily masticated and digested. It is usually given in portions at a time, familiarly known under the term feeds, the measure of which, however, varies in different districts. A feed in some places consists of a gallon, being the eighth part of a bushel, and weighing, upon a medium, about 4½ lbs.

Two gallons in the day, or 9 lbs., are considered to be good feeding when the horse is on dry food, and not on hard work; when on hard work, the quantity may be increased to 3 gallons, and when on light work, and green food, it may be reduced to 1 gallon, and sometimes altogether withdrawn. But on an average, 2 gallons in the day, that is, about 90 bushels in the year, will be sufficient in every case for the working horse of a farm. In practice, too, it is not the superior but the lighter oats that are given to the farm-horses. These are the light corn formerly described.

Oats may be given to horses reduced to a state of meal, but this is only practised in the case of gruel given to a sick horse. To induce a horse to take gruel, it is put into a pail and placed beside him, so that when thirsty he may drink of it.

Meal is sometimes given with cold water to horses, when travelling. This is a refreshing feed to a horse on a journey, and a safe one when the chill is just taken off the water; but it is chiefly employed in journeys when time is of importance, and it is accordingly rarely given in the case of the farm-horse, who should always have time given him to feed.

When oats are kept in a damp state, fungi grow upon them, and they acquire a musty smell and bad taste. They should never be given in this state to a horse, but should first be kiln-dried, so as to expel the moisture and destroy the fungi.

Barley is more nutritious than oats, although, in the practice of this country, it is not so much approved of in feeding. But over all the continent, barley is the most common food of the horse. If bruised and mixed with chopped straw or hay, it is an excellent provender. But the most common method of giving barley to horses in England is in what is termed a mash. The barley in this case is boiled in water, and the whole is then allowed to stand until it is sufficiently cool. The mash forms admirable feeding for a sick horse; it keeps the bowels open, and is nutritive, without being heating.

Wheat is rarely used for the feeding of the horse, the proper destination of wheat being the food of man. The only case, in general, in which wheat, with a regard to economy, can be applied to the feeding of the horse, is in that of light wheat, which, being made into a mash, may be given to a sick horse in the same manner as barley.

Beans form an esteemed food for the horse. They are somewhat more astringent than oats, and correct the tendency to laxativeness when it exists. They should in all cases be bruised, and mixed with other farinaceous food.

The pea is similar in its feeding properties to the bean, and is even supposed to be more nutritive. It is, however, a dangerous food to be given in too great quantity, from its tendency to swell in the stomach. It should, like the bean, be bruised, and given along with other food.

The details in the manner of feeding the farm-horse necessarily differ according to the practices of different districts. The following is a system, simple, efficient, and capable of being reduced to practice upon every farm:—

When the pastures, or other green food, fail in autumn, which will generally be by the beginning of October, the horses are to be put on hard food. They should receive at this period an allowance of hay at the rate of 20 lbs. in the day, with 2 gallons of oats; or, in place of a portion of the oats, they may receive at night a feed of steamed food, consisting of potatoes, or any other roots, mixed with a little corn, and seasoned with salt. The whole quantity may be a peck, weighing about 12lbs. The quantity of potatoes that corresponds in nourishment with oats, is in the proportion of about 15 lbs. of raw potatoes to 1 gallon of oats.

In the months of November, December, and January, when the days and the time of labour are short, the hay may be withdrawn, and the horses, in place of it, fed on straw, of which the best, when it can be obtained, is that of beans or peas. Next to these in quality is that of oats. The straw of wheat and barley is in this country only used as litter, though, were it to be cut into chaff, it could be advantageously used as fodder.

At this time the horses should receive 2 gallons of oats in the day; or the quantity of oats may be diminished, and a portion of steamed food given at night. They should receive, as before, two feeds, one in the morning before going to work, and one at mid-day, and their steamed food at night. By the beginning of February, they should again be put on hay, in preparation for their harder work in spring. At or before the time of sowing the oats, that being the commencement of the season of active labour, the horses should receive their full allowance of 3 gallons of oats in the day, or, in place of a portion of their dry oats, a corresponding allowance of steamed food. They should be fed three times in the day, a feed of oats being given in the morning, a feed at mid-day between the intervals of work, and at night they may either receive their third feed of dry oats, or a corresponding quantity of steamed food mixed with their oats.

They are to receive this full allowance of hay and corn until about the beginning of June, when they may receive green food, on which they are fed during the remainder of the season, their daily allowance of oats being reduced to 1 gallon.

Three methods of feeding them on green food may be adopted:—they may be turned out to pasture in the fields; they may have green forage cut and brought home to them in the yards or stalls; or they may be fed in the intervals of work on green food, and turned out in the evening to the fields to pasture.

When the first of these methods is adopted, that is, when the horses are simply pastured, they are merely turned out to the field at night after work; they are caught again, or driven home to the stables, in the morning, and then again turned out after the morning's work, which may be about 10 o'clock, and allowed to feed till the afternoon's work, which may begin about 1 o'clock; they are then caught and again set to work.

The defects of this mode of management are apparent. Time is lost in taking the animals to and from the field during the intervals of work; and then, having to gather their own food, they have too short a time for rest and feeding during the interval.

The second practice mentioned is, to turn the horses out to pasture at night after work, but in the interval in the middle of the day, to give them cut green forage, which is brought home, and given to them in the stall or stable. In this manner they feed at leisure, undisturbed by insects, and having their food collected to them, waste no time in gathering it in those hours which are suffered to elapse between the labour of the morning and that of the afternoon. This is an approved method of managing the horses of the farm. Their health is the better for their being kept out at night, while the advantage of this is combined with the economical practice of soiling.

The other method of feeding is, to keep the horses constantly in the stable, or in a yard with sheds, and to feed them entirely on green forage. There is economy with respect to feeding in this system, and though it would seem to be scarcely so conducive to the permanent health of horses, as to give them a run out in the fields in the summer nights, yet it is found to be perfectly suited to the habits and condition of the farm-horse. Where it is practised, it is better to keep the horses in yards with sheds, than to confine them entirely to the stables. To carry on a system of soiling where clover and rye-grass are the forage plants employed, a quantity of tares, equal to $\frac{1}{4}$ acre for each horse, should be sown, to be given to the horses in the intervals between the first and second cutting of clover, or when they are engaged at hard work in harvest, or at other times.

In the northern parts of this country, farmers cannot generally begin to cut clover till the 1st of June; but in the southern part of the country, the soiling can be commenced much earlier. When there are many horses, one man may be employed to do the work of cutting and putting the cut forage in bunches, and it should be taken home by a spare horse, so as to be ready when the horses return from work. One man will put into bunches a quantity sufficient for 20 horses, and each horse will consume upon an average about 200 lbs. in a day.

When the horses are turned out to the fields at night, and kept on cut forage during the day, they should be put into their stables by the beginning of September, and kept in the house during the night, receiving green forage if it is yet upon the farm, or else receiving hay. By the 1st of October they should generally be put upon hay and corn.

This, then, forms the circle of feeding of the horses of the farm:—They are put on hard food by the beginning of October, receiving hay and a medium allowance of oats. In the months of November, December, and January, their hay is withdrawn, and they are put on straw, receiving a moderate allowance of oats. In February, they are again put on hay, with a full allowance of oats, until about the commencement of June, when they are put on green food, with a lessened allowance of oats, and either fed entirely on cut forage, or pastured during the night, receiving cut forage during the intervals of work in the day.

In the practice of feeding farm-horses, the utmost care must be taken that they never be allowed to get out of condition. In this case, not only are they unable to perform their work, but it requires a much greater expense to bring them again into order, than it would have required to keep them so.

In feeding horses, even when upon hard work, a practice has been introduced of feeding the horses entirely on boiled or steamed food, with chopped hay and straw. The proportions of the different kinds of food employed in this manner are not subject to rule. But about $\frac{1}{4}$ in weight of the whole may consist of the chaff of straw, $\frac{1}{4}$ of the chaff of hay, $\frac{1}{4}$ of bruised or coarsely ground grain, and $\frac{1}{4}$ may consist of steamed potatoes. To this should be added about 2 oz. of common salt. From 30 to 35 lbs. of this mixed provender, or on an average $32\frac{1}{2}$ lbs. in 24 hours, will suffice for any horse.

Two methods may be adopted in the giving of this food. Either the whole substances may be mixed together, and a certain proportion given to the horses three or four times in the day; or the dried food alone may be given during the first part of the day, and the steamed food mixed with a portion of the dried food in a mess at night.

In the first case, that is, when the whole mess is to be mixed together, the potatoes or other steamed food are first to be prepared, then weighed and mixed with the chopped straw or hay, and with the bruised oats.

The quantity for 24 hours being mixed and prepared, the proportion for each horse is to be weighed and set apart in its proper pail, and given to each horse at three or more times, as shall best suit with the work with which he is engaged, taking care that considerably the largest quantity shall be given at night.

When this method of feeding is adopted upon a farm, it should be confined entirely to the months of winter, for the horses of a farm will always be best and most economically fed during the months of summer on pasture and green forage.

From the mixed nature of our husbandry, the habits of the people, and the attention paid to the rearing of the horse, a long and general preference has been given to this animal for the labours of the farm. In certain districts of England the ox is still the more common beast of labour; but in by much the greater number, the ox is either unknown as an animal of draught, or employed only partially as an assistant.

The ox is a less expensive animal to rear to the age of labour than the horse; his subsequent cost of maintenance is smaller; he requires less care and attendance, and he is less subject to accidents and diseases. He has this further advantage over the horse, that, at a certain age, when unfit for labour, he can be fattened, whereas the horse declines after a time, and becomes useless. But the ox, though well suited for a slow and steady draught, such as the plough demands, is not so well adapted for active motion or distant carriages as the horse. Although patient of labour, he sinks under extreme fatigue, and is not capable of those sudden exertions which the diversified operations of our agriculture require. The horse, therefore, which unites force of draught with quick action, facility of travelling, and the power of bearing great fatigue, is in these respects better suited than the ox to the varied labours of an extended farm. As agriculture, accordingly, has improved, the use of oxen has given place to that of horses for the common purposes of the farm.

Being thus employed as the principal or only animal of draught on farms of this country, being in universal demand for carriages of every kind, and for the innumerable purposes to which he is adapted, the breeding and rearing of the horse form an important branch in rural economy.

The training of horses is a matter of great nicety. They are trained for various purposes, but mainly for the conveyance of our persons, or the transportation of our goods. In old times burdens were transported from place to place on the backs of pack-horses—and this is still the case in many new settlements, and mountainous regions. But as improvements took place in roads, vehicles, suitable for carriage, and drawn by horses in harness, were substituted.

In training saddle-horses the first thing is to make them familiar with man, and other general objects, and which is best effected at the earliest periods, which saves much trouble in the breaking—and docility follows as a matter of course. To accomplish this, the greatest kindness should be used towards the colts from the time they are dropped. They should be frequently handled, fed occasionally with bread from the hand, patted on various parts of the body, have light matters put on their heads and backs, and subjects of different colours and forms should be shown them with caution. The mare and foal should be led out into roads where carriages pass, but nothing should be suffered to intimidate the foal. The animal is thus easily prepared for future operations—and it is thus that the single foal the ploughed-land farmer breeds, and which daily follows the mother in her work, as it were, breaks itself.

Backing is the next operation, and is a matter of great moment, as the future value of the animal depends upon it. It should be commenced when the colt is from two and a half to three years old, and if it has been previously kindly treated, it will not be found a difficult task, and will require to accomplish it, nothing but patience and gentle usage. After becoming habituated to the saddle, and somewhat obedient, he is to be taken to some ploughed land, where he is to be walked or trotted until slightly fatigued. If refractory, and he refuses to lift his feet sufficiently high on the ploughed land, let a field and a road be used alternately. To ensure obedience, this preliminary practice should be performed in a cavesson.*

Two persons, it will be understood, are engaged in this operation, one of whom takes the colt by the head and leads or trots him as necessary. When, from the nature of the exercise, he is perfectly tractable, let a person, familiar to the animal, lay himself gently and by degrees across his back, and if the colt is not alarmed, he should be led at a foot-pace with his burthen, another horse and rider going before him. One leg should be gently slid over his back, the person at his head attracting his attention and encouraging him. The rider raises himself gradually up, and the next step is to mount him in the usual way, which must by no means be done suddenly or at a jerk, but very slowly by several gradual risings.

This being accomplished and borne patiently, the rider fixes himself firmly in the saddle. He should then be led after the other horse, and from a walk proceed to a slow trot. If he hesitates or faulters, mild measures must be used perseveringly, and they have never failed. If not, before he is exhausted, suspend the operation, and when resumed on the following day, the rider should mount and dismount several times, always caressing the animal and using the most soothing language. In preparing him for this process, it is the practice of some eminent horsemen, to lay a small weight on the saddle, increasing from time to time, until it is equal to the weight of a man of ordinary size.

By this process, horses may be broken without a blow, and though sufficiently tamed, they preserve their native spirit unimpaired. In teaching a horse to *draw*, he should be placed alongside the most docile and gentle on the farm; and the

* *Caveçon*, Fr.—A nose band which is placed on the nose of a young horse to facilitate the breaking of him.

draught should be light at first, and may be gradually increased until he has acquired the habit of drawing steadily. When thoroughly broken in the team, he may be put to the single draught; but at first the loads should be light.

The three natural and ordinary movements of horses are, walking, trotting and galloping, to which, says PARKINSON, some horses naturally add another, which is known by the name of "ambling" or "pacing." The trot is, perhaps, the most natural motion of a horse; but the pace and even gallop, are most easy to the rider.

The diseases of the horse are as numerous and as important as his complicated structure, and the artificial state of his present mode of life would lead one to expect. Until of late years, the treatment of these diseases was confided to the hands of generally the ignorant and presumptuous; but now, a highly improved practice exists, and its blessings are widely diffused.

II. THE ASS AND THE MULE.

THE ass, (*Equus asinus*,) is a native of the mountainous deserts of Asia. They abound in Tartary, Arabia, and Persia, and have been the servant of man from the earliest records of the human race. He is at present domesticated throughout most civilized countries; but on his native deserts and mountains only is he seen in his perfect state. The manners of the wild ass are in many respects similar to those of the wild horse; extremely shy and vigilant, and marshalling themselves together under the direction of a leader or sentinel. They feed on the most saline and bitter plants, and prefer the most brackish water to fresh. They are proverbial for their swiftness. When domesticated, they are remarkable for their meekness, patience, tranquillity and attachment to their masters. The ass and the mule feed on the coarsest herbage; but the ass will slake his thirst at none but the clearest fountains and brooks.

Were we to judge of the value and importance of this creature from the feeble services he is able to render us in his present oppressed and degraded state, we should form a very false estimate of his importance. He is an inhabitant of the deserts, and an invaluable servant in the burning regions in which nature has fitted him to exist. But yet more than this, he is endowed with the power of propagating a race of creatures of the highest importance to many countries. The *mule*, to which we refer, as an animal of burden in a rocky and precipitous country, far excels the horse or any other animal—and countries would remain separated from each other, by impassable barriers, were it not for the matchless sagacity, patience and sure-footedness of the mule. The *hinny*, is the hybrid produce between the she-ass and a stallion, but being of little or no value the race is not cultivated.

III. NEAT CATTLE—THE OX.

Naturalists enumerate eight species of the ox family, viz: 1. *Bos urus*, the aurochs or bison of the ancients. 2. *Bos bison*, the bison or buffalo of America. 3. *Bos moschatus*, the musk ox. 4. *Bos frontalis*, the gayal. 5. *Bos grunniens*, the grunting ox. 6. *Bos caffer*, the cape buffalo. 7. *Bos bubalus*, the common buffalo. 8. *Bos taurus*, the domestic ox. Of these species, the aurochs, the bison of America, the musk ox, and the cape buffalo, have not been, and probably never will be domesticated. The cultivation and use of the gayal and the grunting ox, is confined to Asia. The species reared in Europe, are the common buffalo and the domestic ox. In the United States, the culture and improvement of the domestic ox, has been attended to exclusively, our best animals being a mixture of the best native with imported stock of superior excellence.

The common buffalo, now an important animal in the rural economy of Italy, was introduced into that country about the beginning of the sixth century, from Eastern India. He is used by the Italians as food. He is not a dainty animal, preferring the rank herbage of marshes and ferns to the richest pasture. But he is sluggish in his movements. The milk of the female is good, but its flesh is not esteemed. This species is cultivated to some extent in Greece and Hungary.

The term cattle, in its most extensive sense, embraces all the large domestic quadrupeds which are used by man for draught or food. In the usual acceptation of the word it is confined to the ox, or what is called black or horned cattle. But as some are not black, and others hornless, the name of *neat cattle* appears more appropriate. The rearing and feeding of cattle is a very important branch of agricultural industry, as much of the prosperity of the farmer depends on the judicious management of live stock, without which his land cannot be maintained in a proper state of fertility. The breeding and fattening of cattle, are now considered generally as two distinct occupations.*

Of all the species the domestic ox is most generally diffused, and beyond all calculation the most valuable. He has existed in a domesticated state beyond all the records of history and tradition; and we are, therefore, left to conjecture alone, as to the parent stock. Like all animals necessary to the comfort and subsistence of man, he suits himself in a wonderful degree to the circumstances in which he is placed. In size, he scarce exceeds the deer, in those regions where the herbage is scanty; but where it is abundant and nutritious, he attains a large growth. He is found from the equator almost to the limits of vegetable life, and is every where subservient to the wants and conveniences of the human race.

The female is in a most remarkable degree subordinate to the interests of mankind. She is every where docile, patient and humble. *Milk*, which forms so nutritive an aliment for the human species, is yielded by her, with an abundance and facility unknown in the case of any other animal. She has a more capacious udder than any creature known to us. Although she gives birth to but one young at a time, she has four teats. Like the sheep and the goat, she yields milk freely to the hand, although far more abundantly; whilst many other animals refuse their milk, unless their own young or some other animal be allowed to partake of it, by sucking them.

Many circumstances have occurred, stretching through a series of years, to render live stock an object of very great importance to the farmer—and notwithstanding the great advances made, and still progressing in other branches of husbandry, none has undergone a greater change of system, or has received more manifest improvement, than the breeding, rearing, and management of cattle. The varieties of the cultivated ox or cattle, are the European, Indian, Zebu, Surat, Abyssinian, Madagascar, Tinian and African. From the European variety has been found the different breeds cultivated in Great Britain and the United States; our native stock, as it is termed, having been principally derived from England; but many of the cattle of the middle states are descended from the stock originally brought over in great numbers by the early Dutch and German emigrants.

They are very numerous; but we only notice such as are in most esteem, and from which our present stock is derived. We consider it important to our farmers generally, and especially to those who are just entering upon, or are about to

* Penny Cyclopædia, vol. vi. p. 378.

engage in the most rational and delightful of all pursuits—agriculture—to have some knowledge of the different breeds or classes of animals. Our limits admonish us of the necessity of brevity, and in our present description of neat cattle, we presume no more than to give a bird's-eye, but still faithful view of the different breeds, their structure, rearing and breeding, mode of management, &c. derived from the best authorities. The varieties of cattle are greatly diversified, both by the different natural circumstances in which they are placed, and by the effects of art in changing their properties and form. To these varieties is generally applied the term *breeds*.

We have already referred to the great varieties of *breeds* in Great Britain, from whence we have derived our imported stock, almost as various as the districts in which they are reared. As a matter of convenience, they have been classed according to their horns. 1. The *long-horns*, originally improved by that most eminent breeder, ROBERT BAKEWELL,* became established in the midland counties. 2. The *short-*

* Mr. YOUATT, in his admirable work—History of British Cattle—says, that it is a disgrace to the agriculture of the times, that BAKEWELL should have been suffered to pass away without an authentic record of the man—the principles that guided him—and the means by which his objects were accomplished. All that we are enabled to furnish our readers on this point, is gleaned from a fugitive paper in the Gentleman's Magazine—year or volume not given—from which we learn that ROBERT BAKEWELL was born at Dishley, in Leicestershire, England, about the year 1725. His father and grandfather had resided on the same estate.

Possessed of an observing and discriminating mind, he was forcibly struck with the great similarity existing among domestic animals. After a careful and laborious investigation, of this (to him) interesting and important subject, he came to the conclusion that, by selecting from the most valuable stock, and pursuing a steady progressive system, he would be able, in the course of time, to produce a breed, possessing many very superior points or qualities. For this purpose he travelled extensively, and examined the different breeds. The result was, that he chose as the basis of his intended improvements, the long horned breed as it then existed. The precise steps which he followed in the course of his experiments are unknown. It is supposed by some—but not supported by an examination of the breed that he produced—that he crossed the native long-horns with some other variety.

Many years did not pass by before his stock was unrivalled for the roundness of its form—the smallness of its bone—its aptitude to acquire external fat—while they were small consumers of food in proportion to their size. But their qualities as milkers were much lessened. The grazier could not too highly value the Dishley or New Leicester short-horns—but the dairyman clung to the old breed as most useful for his purpose.—*British Cattle*, 192. He lived to witness the complete triumph of his system—the overthrow of its opponents—the dissipation of all prejudice. He died (1795) verging on his seventieth year. His countenance bespoke activity, and a high degree of benevolence. His manners were frank and pleasing, and well calculated to maintain the extensive popularity he had acquired. His hospitality to strangers was bounded only by his means. Many anecdotes are related of his humanity to the brute creation. He would not suffer the slightest act of cruelty to be perpetrated by any of his servants, and he sternly deprecated the barbarities practised by drovers and butchers, showing by examples on his own farm, the most pleasing instances of docility in every animal.

horns, improved in Durham, whence the latter name, widely diffused throughout the kingdom, especially in all dairy districts, on account of their peculiar milking qualities. 3. The *middle-horns*, a distinct, valuable and beautiful breed, without any mixture whatever with the two preceding classes. These, however, have been intermixed in every possible way, and are found pure only in their native districts—as for instance the long-horns in Leicestershire—the short-horns in Durham—and the middle-horns in Devon. But the more natural, main or proper division of breeds, we conceive to be into those of the *mountains* and those of the *plains*.

The proper form and shape of cattle is a matter of great importance to the farmer and breeder, for whatever may be the breed, there are certain conformations which are indispensable to the thriving and valuable ox or cow. When we have a clear idea of these, we shall be able more easily to form an accurate judgment of the different breeds. If there is one part of the frame, the form of which, more than of any other, renders the animal valuable, it is the chest. There must be room enough for the heart to beat, and the lungs to play, or sufficient blood for the purposes of nutriment and of strength will not be circulated; nor will it thoroughly undergo that vital change, which is essential to the proper discharge of every function. We look, therefore, first of all to the wide and deep girth about the heart and lungs. We must have both: the proportion in which the one or the other may preponderate, will depend on the service we require from the animal; we can excuse a slight degree of flatness of the sides, for he will be lighter in the forehand, and more active; but the grazier must have width as well as depth. And not only about the heart and lungs, but over the whole of the ribs, must we have both length and roundness; the *hooped*, as well as the deep barrel is essential; there must be room for the capacious paunch, room for the materials from which the blood is to be provided. The beast should also be ribbed home; there should be little space between the ribs and the hips. This seems to be indispensable in the ox, as it regards a good healthy constitution, and a propensity to fatten; but a largeness and drooping of the belly is excusable in the cow, or rather, notwithstanding it diminishes the beauty of the animal, it leaves room for the udder; and if it is also accompanied by swelling milk veins, it generally indicates her value in the dairy.

This roundness and depth of the barrel, however, is most advantageous in proportion as it is found behind the point of the elbow, more than between the shoulders and legs: or low down between the legs, rather than upwards towards the withers: for it diminishes the heaviness before, and the comparative bulk of the coarser parts of the animal, which is always a very great consideration.

The loins should be wide: of this there can be no doubt, for they are the prime parts; they should seem to extend far along the back: and although the belly should not hang down, the flanks should be round and deep. Of the hips it is superfluous to say that, without being ragged, they should be large; round rather than wide, and presenting, when handled, plenty of muscle and fat. The thighs should be full and long, close together when viewed from behind, and the farther down they continue to be so the better. The legs short, varying like other parts according to the destination of the animal; but decidedly short, for there is an almost inseparable connection between length of leg and lightness of carcass, and shortness of leg and propensity to fatten. The bones of the legs, and they only being taken as a sample of the bony structure of the frame generally, should be small, but not too small—small enough for the well known accompaniment, a propensity to fatten—small enough to please the consumer; but not so small as to indicate delicacy of constitution, and liability to disease.

Last of all the hide—the most important thing of all—thin, but not so thin as to indicate that the animal can endure no hardship; moveable, mellow, but not too loose, and particularly well covered with fine and soft hair.*

The WILD BREED, from which the improved breeds have descended, being untameable, are very rarely met with in Europe; a few are to be found, says Mr. CULLY, in the parks of some public spirited gentlemen in England, who have them confined in enclosures, high and firm, for ornament and curiosity. Their colour is invariably of a creamy white—the muzzle black—the whole of the inside of the ear and about one-third of the outside from the tips downwards red—horns white, with black tips, very fine and bent upwards. Some of the bulls have a thin upright mane, about an inch and a half or two inches. The weight of the ox ranges from five to six hundred and fifty pounds, and the cows from three hundred and fifty to five hundred pounds the four quarters. The beef is finely *marbled* and of excellent flavour. The mode of killing them was perhaps the only remains of the grandeur of ancient hunting. They are exceedingly shy; the cows hide their calves for a week or ten days, in some sequestered spot, and go and suckle them several times a day.†

The *long-horns*, which extend over the western districts of England, and the richer parts of Ireland, were, at an early period, more generally diffused than any of the other races of large cattle. The individuals of this breed are distinguished from others "by the length of their horns, which generally incline downwards—the thickness and fine texture of their hides—the length and closeness of their hair—the large size of their hoofs, and their coarse leathery necks. They are not good milkers."‡ They are frequently termed the *Lancashire breed*. The district of Craven was long celebrated for its long-horns, called the *Craven breed*. In the early part of the last century the *Cauley breed* acquired, and for a considerable length of time maintained, a high reputation, through the judicious and well directed exertions of Mr. WEBSTER, of Cauley. To this breed, and partly derived from it, succeeded the *Dishley breed*, so named from ROBERT BAKEWELL, of Dishley, in the county of Leicester, who, soon after the middle of the last century, began those improvements in live-stock which exercised so great an influence on—not merely on the long-horned breed of cattle—but upon all the varieties and races of domesticated animals in almost every country, down to the present day.

The chief improvements effected, seem to be their early

* Library of Useful Knowledge—British Cattle—YOUATT—CLINE.
† CULLY on Live Stock.
‡ Mr. CULLY. Their milk, though not large in quantity, was exceeding rich in cream—hence their adaptation to the dairy.

maturity and aptitude to fatten rapidly on the most valuable points, and in the superior quality or excellence of the flesh, it being fine grained, and the fat beautifully intermixed with the muscles. Whatever may be the merits of the long-horned cattle, comparatively with the other improved breeds of the present day, it must be admitted, says the Editor of the Complete Grazier, that they rank among the finest in the kingdom; and it is certain, that the perfection which they have attained in the hands of the eminent breeders of the present day, has been acquired through the medium of the Dishley blood.

The modern improvements made in the long-horned cattle, since the first attempts of BAKEWELL, are considered to consist chiefly in the coarser parts having been reduced, and the more valuable enlarged. The present breed is finer boned, and finer in the neck, throat and breast—the back is straight, wide, and well covered with flesh—the rump is also wide, and particularly fleshy on the points and about the root of the tail.—*Complete Grazier.*

The SHORT-HORNED CATTLE, under which denomination are indiscriminately included the *Dutch*, *Holderness*, *Teeswater*, *Yorkshire*, *Durham*, *Northumberland*, and other breeds of these varieties of the short-horned breed. The *Teeswater* and the *Durham* varieties of the short-horns, are at present held in the highest estimation; they are very nearly allied to each other; and bulls and cows purchased at the most extraordinary prices, are spread over England, Scotland, and the United States. The enterprising farmers of our western states—indeed our farmers generally, prefer the Durham—hence that variety is more generally found among us.

The bone, head and neck of these cattle are very fine—back level—throat clean—the hide very thin—chine full—the loin broad—the carcass throughout large and well fashioned—quarters long—hips and rumps even and wide—the flesh and fattening quality equal, probably superior to those of any other large breed. They stand rather high on their legs, and handle very kindly. The short-horns are better milkers than any other variety or breed—a cow generally yielding from twenty-four to thirty quarts of milk per day, of the richest quality.* They differ from other breeds, not only in the shortness of their horns, but in their more square and massy form—consequently feeding to greater weight, in affording the greatest quantity of tallow when fatted. The heaviest and largest oxen of this breed, when properly fed, are selected in preference to all others for victualling the East India ships, as they produce the thickest beef, which, by retaining its juices, is the best adapted for all long voyages.

To Messrs. CHARLES and ROBERT COLLINS, of Darlington, in the county of Durham, belongs the honour of bringing to its present state of improvement, the valuable breed we have now under consideration. Towards the close of the last century, many individuals distinguished themselves as breeders of the Teeswater short-horns. But it was left to these gentlemen to complete what others had undertaken. By judicious and happy selection, CHARLES COLLINS did for the short-horns, what Mr. BAKEWELL, years before, had done for the long-

* The superior *quality* of the milk is disputed by the advocates of the middle-horns.

horns. His improvements were made on a better basis, and the result was a superior class of cattle, the reputation of which becoming established about the year 1800, it began to supersede other breeds in every part of the country.* This breed received very generally the name of *Durham*, and from it is derived the valuable stock in this country known by that name.

The improved short-horned breed of cattle, was first brought into extensive notice, and its reputation established about the commencement of the present century, by the production of the celebrated "Durham ox," an animal which speaks volumes in favour of a single cross of this blood, for the ox was the produce of a common cow, which had been put to "Favourite," in 1796.† In 1801, when five years old, he was thought to be so wonderful an animal, that he was purchased for exhibition, for five hundred and forty dollars—his live weight being then two hundred and twenty-six stone, or three thousand one hundred and sixty-four pounds. The first sale was in February, and in the following May he was sold for eleven hundred dollars, and in two months afterwards eight thousand dollars were offered and refused. He was exhibited in nearly all parts of England to great advantage, until April, 1807, when he was killed, in consequence of having dislocated his hip, eight weeks previously; and notwithstanding he must have lost weight during these eight weeks of illness, his carcass weighed two thousand six hundred and twenty pounds, viz: four quarters, two thousand three hundred and twenty-two—tallow, one hundred and sixty-four—hide, one hundred and forty-two.

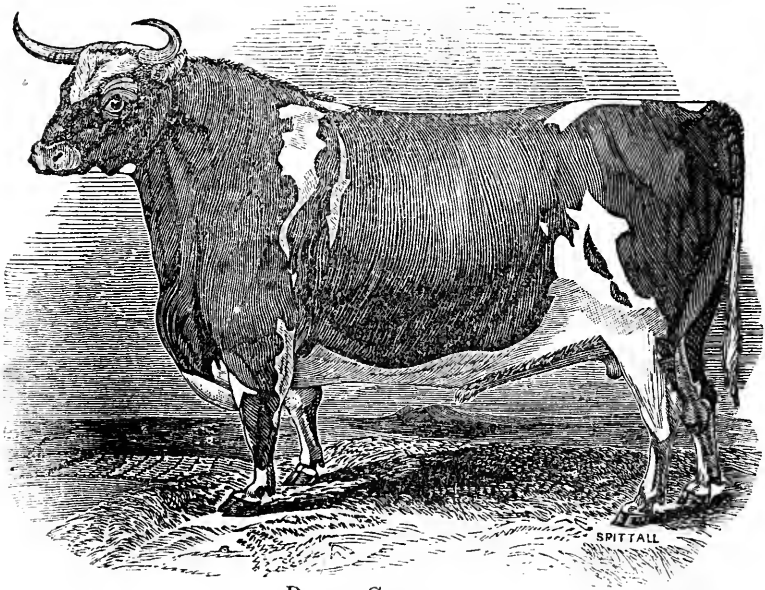
Uncommon as this animal then was, he has frequently of late, been greatly exceeded in every respect, by individuals of the same family in England and in America. There are very many instances in the United States, of cattle possessing every point of excellence, attaining the weight of from three to four thousand pounds.‡ Our limits forbid—indeed it is foreign to

* The first improvement attempted by Mr. Collins on the Teeswater breed, which were originally, like all other extravagantly large cattle, frequently of loose make and disproportion, was a reduction of the size of this breed, and at the same time, and by the same means, to improve its form. This, he is supposed to have effected in the first instance, through the medium of a bull called "*Hubback*," an animal, respecting which there has been much controversy, principally touching the purity of his blood.

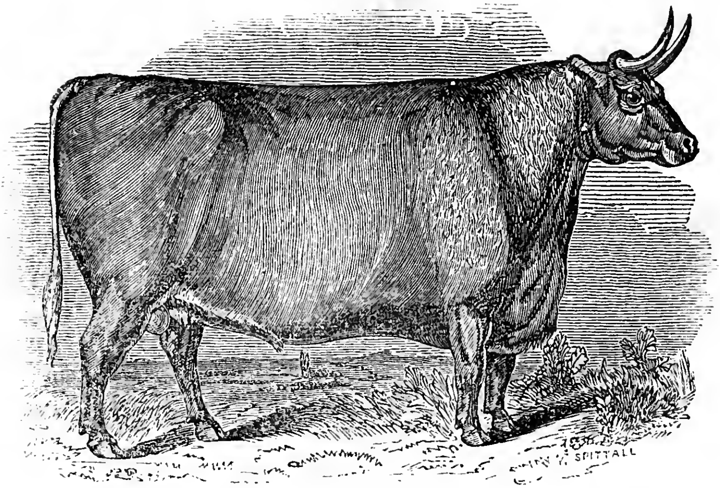
† Hubback was the sire of the dam of Mr. Charles Collins' bull Foljambe, who was the grandsire of Favourite, and there can be no doubt that there has not been for many years any superior short-horn which was not descended from Favourite.—Youatt.

‡ The famous Yankee ox—"Brother Jonathan"—has, we believe, been taken across the great water, to pay his respects in person to his brother John Bull. If they cannot compare *notes*, they will have no difficulty in comparing *points* and *horns*.

our purpose, to notice all the animals reared in this country possessing this peculiar trait. We will, however, advert to one or two. In 1812 the ox "Leopard," reared by Dr. William Elmer, of Bridgeton, Cumberland county, New Jersey, weighing three thousand three hundred and sixty pounds, was slaughtered in Philadelphia.

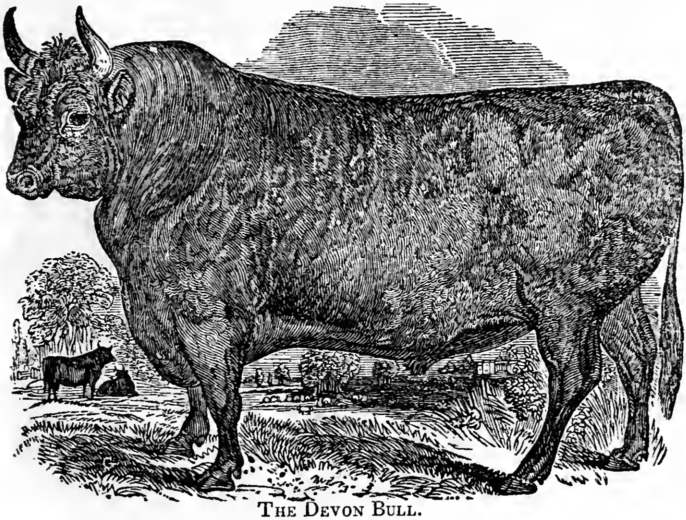


Duke of Gloucester.



Earl of Jersey.

The Duke of Gloucester and the Earl of Jersey, two noble animals of the short-horned Durham, crossed with the native American breed, were raised by that judicious breeder of good stock, Mr. Edward Tonkin, of Woodbury, Gloucester county, New Jersey. When a little over seven years old they were sold for three thousand five hundred dollars. At the time of sale their weight was as follows: Earl of Jersey, three thousand and forty pounds—Duke of Gloucester, three thousand and forty-two pounds. The portraits of these animals here given are correct and striking, as they appeared in December, 1837. They have been exhibited in various parts of the Union,* and in July, 1839, notwithstanding the fatigue of travel, they were estimated by very competent judges to weigh four thousand pounds each.



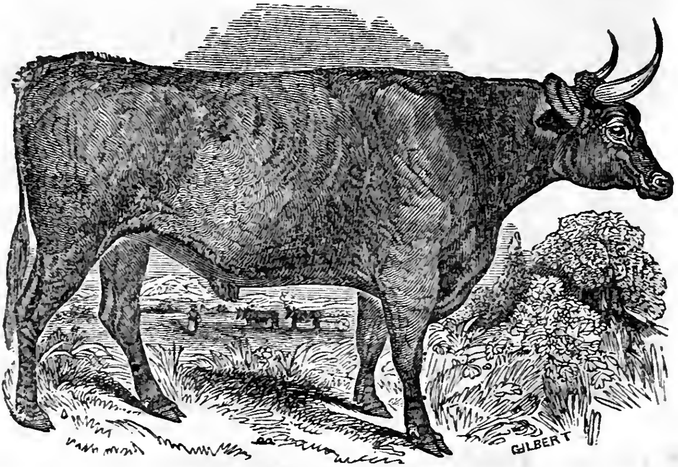
The Devon Bull.

The Devon or middle-horns, forms a beautiful and peculiar variety—they are of a family widely extended, as cattle possessing very similar properties are found not only in England, but in America, on the banks of the Don, along the borders of the Vistula, the confines of Poland and many other places. The true Devon, however, is found in the state of greatest purity in Devonshire, and the adjacent counties, in England, and in those sections of the United States whence they have been imported from Devonshire. More allied to the lighter breeds

* The names given these noble animals by Mr. Tonkin, were certainly most appropriate; but the purchasers saw fit to change them. They are now called Henry Clay and Daniel Webster.

of elevated countries, than to the larger breeds of the plains, their general form is light and graceful. All writers on live-stock, speak of these cattle, when pure, in the highest terms. CULLY, DICKSON, MARSHALL, LAWRENCE, BERRY, ROBERTSON, all express but one opinion; while PARKINSON says, they are a model for all persons who breed oxen for the yoke.

But we are not to be understood as either advancing or endorsing an opinion that they are superior to all other breeds in every respect. That they possess certain points of superior and peculiar excellence, we cannot doubt. On account of their activity and hardiness, they are admirably calculated for the draught, and they feed well at an early age when not employed in labour; but compared with the Durhams they are very deficient milkers. We consider the pure Durham, in the aggregate, as fully equal to the Devonshire. We should be glad to see both breeds more widely diffused throughout our country.



THE WORKING DEVON OX.

Proper Form and Shape of Cattle. With all the lightness of the Devonshire ox, there is a point about him, disliked in the blood or riding-horse, and not always approved in the horse of light draught,—the legs are far under the chest, or rather the breast projects far and wide before the legs. We see the advantage of this in the beast of slow draught, who rarely breaks into a trot, except when he is goaded on in *catching times*, and the division of whose foot secures him from stumbling. The lightness of the other parts of his form, however, counterbalances the appearance of heaviness here.

The legs are straight, at least in the best breeds. If they are in-kneed, or crooked in the fore-legs, it argues a deficiency in blood, and comparative incapacity for work; and not only for work, but for grazing too, for they will be hollow behind the withers, a point for which nothing can compensate, because it takes away so much from the place where good flesh and fat should be thickly laid on, and diminishes the capacity of the chest and the power of creating arterial and nutritious blood.

The fore-arm is particularly large and powerful. It swells out suddenly above the knee, but is soon lost in the substance of the shoulder. Below the knee the bone is small to a very extraordinary degree, indicating a seeming want of strength; but this impression immediately ceases, for the smallness is only in front—it is only the bone: the leg is deep, and the sinews are far removed from the bone. It is the leg of the blood-horse, promising both strength and speed. It may perhaps be objected that the leg is a little too long. It would be so in an animal that is destined only to graze; but this is a working animal; and some length of leg is necessary to get him pleasantly and actively over the ground.

There is a trifling fall behind the withers, but no *hollowness*, and the line of the back is straight from them to the setting on of the tail. If there is any seeming fault in the beast, it is that the sides are a little too flat. It will appear, however, that this does not interfere with feeding, while a deep, although somewhat flat chest is best adapted for speed.

Not only is the breast broad and the chest deep, but the two last ribs are particularly bold and prominent, leaving room for the stomachs and other parts concerned in digestion to be fully developed. The hips or huckles are high, and on a level with the back, whether the beast is fat or lean. The hind quarters, or the space from the huckle to the point of the rump, are particularly long, and well filled up—a point likewise of very considerable importance both for grazing and working. It leaves room for flesh in the most valuable part, and, like the extensive and swelling quarters of the blood-horse, indicate much power behind, equally connected with strength and speed. This is an improvement quite of modern date. The fulness here, and the swelling out of the thigh below, are of much more consequence than the prominence of fat which is so much admired on the rump of many prize cattle.

The setting on of the tail is high; it is on a level with the back; rarely much elevated, and never depressed. This is another great point in the blood-horse, as connected with the perfection of the hind quarters. The tail itself is long and small, and tapering, with a round bunch of hair at the bottom.

The skin of the Devon, notwithstanding his curly hair, is exceedingly mellow and elastic. Graziers know that there is not a more important point than this. When the skin can be easily raised from the hips, it shows that there is room to set on fat below.

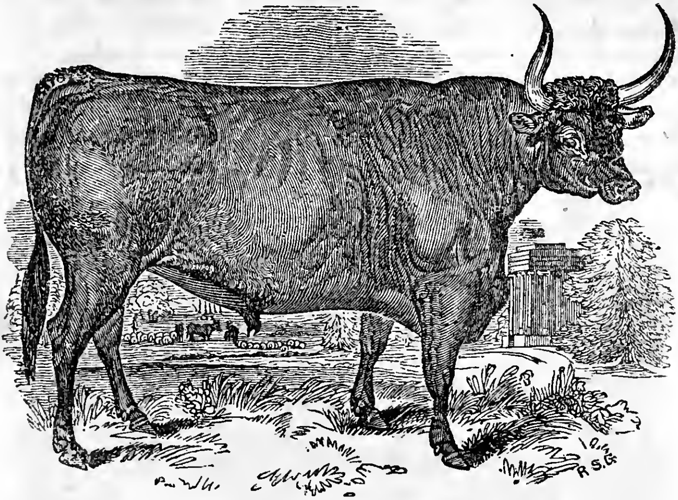
The skin is thin rather than thick. Its appearance of thickness arises from the curly hair with which it is covered, and curly in proportion to the condition and health of the animal. Good judges of these cattle speak of these curls as running like little ripples of wind on a pond of water. Some of these cattle have the hair smooth, but then it should be fine and glossy. Those with curled hair are somewhat more hardy, and fatten more kindly. The favourite colour is a blood red. This is supposed to indicate purity of breed; but there are many good cattle approaching almost to a chestnut hue, or even a bay brown. If the eye is clear and good, and the skin mellow, the paler colours will bear hard work and fatten as well as others; but a beast with a pale skin, and hard under the hand, and the eye dark and dead, will be a sluggish worker, and an unprofitable feeder. Those, however, that are of a yellow colour, are said to be subject to *steat* (diarrhœa).

Some breeders object to the slightest intermixture of white —not even a star upon the forehead is allowed—yet a few good oxen have large distant patches of white; but if the colours run into each other, the beasts are condemned as of a mongrel and valueless breed.

These are the principal points of a good Devonshire ox; but he used to be, perhaps he is yet, a little too flat-sided, and the rump narrowed too rapidly behind the hip bones; he was not sufficiently ribbed home, or there was too much space between the hip bones and the last rib; and altogether he was too light for some tenacious and strong soils. The cut of the working ox, on page 338, contains the portrait of one embodying almost every good point of which we have spoken.

Mr. Western has kindly enabled us here to add another portrait from his farm. It is a son of the bull given on page 337, and is a faithful representation of an ox beginning to fatten, but his characteristic points not yet concealed. Mr. Western has carefully preserved this breed unmixed for the last thirty years, and all the cattle that he fattens are Devons: he rarely uses them for the plough.

A selection from the most perfect animals of the true breed —the bone still small and the neck fine, but the brisket deep and wide, and down to the knees, and not an atom of flatness all over the side—or one cross, and only one with the Hereford, and that stealthily made—these have improved the strength and bulk of the North Devon ox, without impairing, in the slightest degree, his activity, his beauty, or his propensity to fatten.*

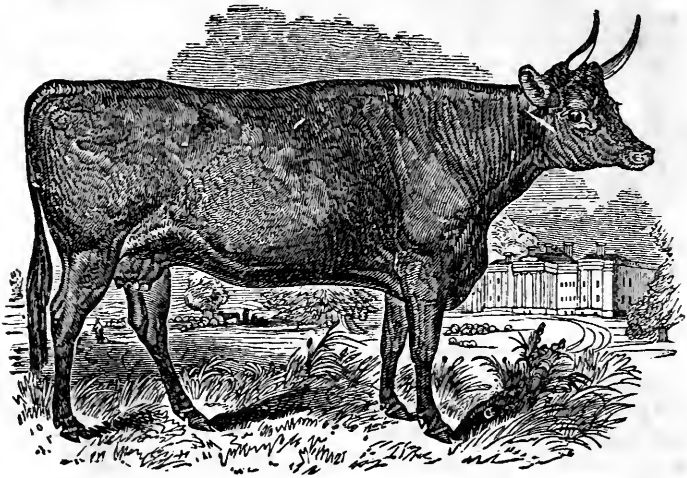


DEVONSHIRE OX.

There are few things more remarkable about the Devonshire cattle than the comparative smallness of the cow. The bull is a great deal less than the ox, and the cow almost as much smaller than the bull. This, however, is some disadvantage, and the breeders are aware of it; for although it may not be necessary to have a large bull, and especially as those of any extraordinary size are seldom handsome in all their points, somewhere or other present coarseness or deformity, it is almost impossible to procure large and serviceable oxen, except from a somewhat *roomy* cow. Those cows, however, although small, possess that roundness and projection of the two or three last ribs, which make them actually more *roomy* than a careless examination of them would indicate. The cow

* In the 'Annals of Agriculture,' vol. xxx. p. 314, we have the opinion, in somewhat provincial terms, of a good west-country grazier, respecting the best form of the Devon cattle. 'He buys at all times, from Christmas to May-day, North Devons, that are bred from Portlock to Biddeford, such as are five or six years old. He chooses such as are small-horned, and of a yellow-coloured horn rather than white—small bones, as such beasts thrive best—rib bones round, not flat—a thick hide bad—a very thin one objectionable—blade bones, chuck—very thick and heavy in the bosom, as much weight lies there—the heavier in the shoulder the better, but not to elbow out—very wide and square from the points down to the thighs—middling in the belly—not cow-bellied—not tucked up.' As a grazier he is right; but this is not the true working Devonshire ox.

is particularly distinguished for her full, round, clear eye, the gold coloured circle round the eye, and the same colour prevailing on the inside skin of the ear. The countenance cheerful, the muzzle orange or yellow, but the rest of the face having nothing of black or even of white about it. The jaws free from thickness and the throat free from dewlap. The points of the back hind quarters different from those of other breeds, having more of roundness and beauty, and being free from most of those angles by which good milkers are sometimes distinguished.



DEVONSHIRE COW.

We are here enabled to present our readers with the portrait of a cow, belonging to that indefatigable agriculturist, Mr. WESTERN. She was rising four years old. With regard to size she is a favourable specimen of the Devon cow. It will be seen at once how much more roomy and fit for breeding she is, than even her somewhat superior bulk would at first indicate. She is, perhaps, in a little better condition than cows generally are, or should be in order to yield their full quantity of milk.

The following account of this breed is from the pen of the Editor of a work called the British Cattle—it is more full than any we have yet seen—but the reader will bear in mind that it is the production of an ardent advocate of the middle-horns or Devons. We believe, however, that he has endeavoured to meet the subject fairly and treat it devoid of prejudice.

The more perfect specimens of the North Devon breed are thus distinguished. The horn of the *bull* ought to be neither too low nor too high, tapering at the points, nor too thick at the root, and of a yellowish or waxy colour. The eye should be clear, bright and prominent, showing much of the white, and it ought to have around it a circle of a variable colour, but usually a dark orange. The forehead should be flat, indented, and small; for by the smallness of the forehead, the purity of the breed is very much estimated. The cheek should be small, and the muzzle fine: the nose should be of a clear yellow. A black muzzle is disliked, and even a mottled one is objected to by some who pretend to be judges of the true Devon. The nostril should be high and open: the hair curled about the head, and giving, at first appearance, an idea of coarseness which soon wears off. The neck should be thick, and that sometimes almost to a fault.

Excepting in the head and neck the form of the bull does not materially differ from that of the ox, but he is considerably smaller. There are some exceptions, however, to this rule, and as an illustration of this, we have inserted the portrait of a pure Devon bull (belonging to Mr. Western,) father of the ox and the cow, portraits of which are given on pages 341 and 342. We may fancy that we trace in this singular and noble animal, the lineaments of the native, and scarcely reclaimed British bull.

The head of the ox is small, very singularly so, relatively to the bulk of the animal, yet it has a striking breadth of forehead. It is clean and free from flesh about the jaws. The eye is very prominent, and the animal has a pleasing vivacity of countenance plainly distinguishing it from the heavy aspect of many other breeds. Its neck is long and thin, admirably adapting it for the collar, and even for the more common and ruder yoke.

The want of the beautifully arched form of the neck, which is seen in the horse, has been considered as a defect in most breeds of cattle. It is accounted one of the characters of good cattle, that the line of the neck from the horns to the withers should scarcely deviate from that of the back. In the Devonshire ox, however, there is a peculiar rising of the forehand, reminding us not a little of the blood-horse, and essentially connected with the free and quick action by which this breed has ever been distinguished. It has little or no dewlap depending from its throat. The horns are longer than those of the bull, smaller and fine even to the base, and of a lighter colour, and sometimes tipped with yellow. The animal is light in the withers; the shoulders a little oblique; the breast deep, and the bosom open and wide, particularly as contrasted with the fineness of the withers. The fore-legs are wide apart, looking like pillars that have to support a great weight. The point of the shoulder is rarely or never seen. There is no projection of bone as in the horse, but there is a kind of level line running on to the neck.

These are characteristic and important points. Angular bony projections are never found in a beast that carries much flesh and fat. The fineness of the withers, the slanting direction of the shoulder, and the broad and open breast, imply both strength and speed, and aptitude to fatten. A narrow-chested animal can never be useful either for working or grazing.

The *improved short-horns* are thus described by James Dickson, Esq., an eminent cattle dealer and breeder in Great Britain. When we survey the frame of a short-horn ox, we have a straight level back from behind the horns to the top of the tail, full buttocks, and a projecting brisket; we have, in short, the rectangular form, as represented in a side view by Fig. 1; we have, also, the level loin across the hook bones, and the level top of the shoulder across the ox, and perpendicular lines down the hind and fore legs on both sides, these constituting the square form, when the ox is viewed before and behind, as represented in Figs. 2 and 3; and we have straight parallel lines from the sides of the shoulders along the utmost points of the ribs to the sides of the hind quarters; and we have these lines connected at their ends by others of shorter and equal length, across the end of the rump and the top of the shoulder, thus constituting the rectangular form of the ox when viewed from above down upon the back, as represented by Fig. 4. We have in this manner, the form of the short-horn ox and heifer in perfect accordance with the diagrams of the rule.

Further, I should be inclined to assert, although I have not directed my attention to the fact sufficiently to be able to prove the assertion from examples, that the cross of a full fed symmetrical short-horn ox, included within the rectangle, is in length double its depth, and its depth equal to its breadth. Hence, Figs. 2 and 3 are squares, and Figs. 1 and 4 each two similar squares, placed in juxtaposition. The short-horn bull deviates from the rule in a rising of the neck, a dependence under the brisket, and a fulness of the neck vein; the cow only a little from the ox or heifer, in a thinness in the buttocks; and besides this, when aged, in an enlargement of the belly, and mostly, though not always, in a hollowness in the loins. The *form*, therefore, of the short-horn breed is perfect according to the rule.

Fig. 4.

Fig. 1.

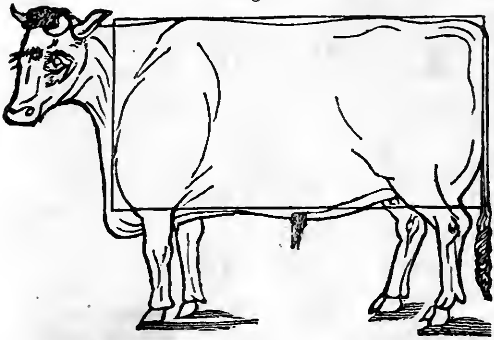
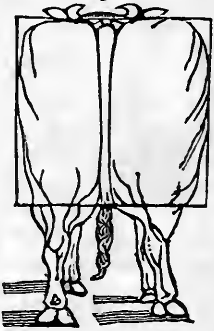


Fig. 2.

Fig. 3.



In its *points* that for quantity and well laid on beef, the short-horn ox is quite full in every valuable part, such as along the back, including the fore ribs, the sirloins and rumps, in the runners, flanks, buttocks, and twist, and in the neck and brisket as inferior parts. In regard to quality of beef, the fat bears a due and even preponderating portion to the lean, the fibres of which are fine and well mixed, and even marbled with fat, and abundantly juicy. The fine, thin, clean bone of the legs and head, with the soft mellow touch of the skin, and the benign aspect of the eye, indicate in a remarkable degree, the disposition to fatten; while the uniform colours of the skin, red or white, or both, commixed in various degrees—bare, cream-coloured skin on the nose and around the eyes, and fine tapering white or light-coloured horns, mark distinctly the purity of the blood. The points of blood and quality, and quantity of beef, apply equally to the bull, the cow, and the heifer, as to the ox. Combining all these properties of points and form, we shall find that the short-horn breed illustrates, in a very satisfactory manner, the application of the general rule which has been explained. On account of its valuable properties, this breed demands further illustration.

The external appearance of the short-horn breed is irresistibly attractive. The exquisitely symmetrical form of the body in every position, bedecked with a skin of the richest hues of red and the richest white, approaching to cream, on both colours, so arranged or commixed as to form a beautiful fleck on delicate roan, and possessed of the mellowest touch—supported on small clean limbs, showing, like those of the race-horse and the grey-hound, the union of strength with fineness; and ornamented with a small lengthy tapering head, neatly set on a broad firm deep neck, and furnished with a small muzzle, wide nostrils, prominent "mildly beaming" eyes, thin large veiny ears, set near the crown of the head, and protected in front with semi-circularly bent white or brownish coloured short, (hence the name,) smooth, pointed horns;—all these several parts combine to form a symmetrical harmony, which has never been surpassed in beauty and sweetness by any other species of the domesticated ox.

Enthusiastic as this language may be considered when applied to the external beauty of cattle, it is not more so than the beauty of cattle is entitled to; for when it is considered that symmetry of form generally accompanies mellowness of touch in the skin, and that both constitute the true index to a disposition to fatten, the most *useful property of all*, beauty of external appearance is too valuable a criterion to be overlooked. Fortunately, indeed, beauty cannot be overlooked in cattle: for even were it useless, it is so irresistibly engaging, that the judgment of a stoic would be biassed in its favour. To my taste, nothing can be so attractive a spectacle of the kind as a show of fine bred short-horns in high condition."

The *Herefords* are of the larger class of oxen—of a red colour, white faces, and more or less of white on other parts—fine hair—thin hides—horns neither long nor short, and inclining upwards at the points. Mr. Marshall says, that in general they are well made in the hind quarters—wide across the hips, rumps and sirloin, but narrow in the chine—tolerably straight along the back—ribs too flat—thin in the thigh, and bone not too large. An ox, six years old, if fat, will weigh from eight to fourteen hundred pounds. This and the *Gloucester variety*, are highly eligible as dairy stock, and the females of the Herefords have been found to fatten better at three years old, than any other kind of cattle, except spayed heifers.

Whatever may be the early history of the Hereford breed, it has long since acquired characters peculiar to itself, and ranks as a distinct breed. But it owes its celebrity to recent changes. Its great improver, or rather, it may be said the founder of the modern breed, was the late Mr. Tomkins, near Hereford. From a very humble stock of cows, by changes or crosses, which he never chose to reveal, he succeeded in forming the beautiful breed from which the modern Hereford takes all its characters. Although of a less agile form than the

Devons, their steady strength and a sufficient degree of activity, suits them well for the draught.

In almost every country there are families of oxen destitute of horns. Few, however, are remarkable for points of peculiar excellence; very little pains having been taken to improve them. They are generally a hardy race, and some varieties are said to be excellent milkers. The most esteemed of the polled or hornless breed in England, is the *Suffolk duns,** but the most generally approved of this race, is the *Galloway breed* of Scotland, to which the Suffolk duns bear some resemblance.

A true Galloway bullock is straight and broad in the back, and nearly level from the head to the rump—closely compacted between the shoulder and ribs, and also betwixt the ribs and the loins—broad at the loins, but not with hooked or projecting knobs. He is long in the quarters, but not broad in the twist—deep in the chest—short in the leg, and moderately fine in the bone—clean in the chop and in the neck. His head is of a moderate size, with large rough ears, full but not prominent eyes, so that he has a calm but determined look—he is clothed in a loose and mellow, though rather thick skin, covered with long, soft and glossy hair.—*Galloway Report.*

There are a great number of minor varieties of cattle to which the term breeds may be applied, but they are generally inferior in points of excellence to those already noticed, from which our stock have been derived—and which almost, if not entirely, engrosses the attention of American farmers.

Improvement of breeds.—The breed must be adapted to the means, natural or acquired, possessed of supplying food. Art and an improved system of tillage do much in supplying the food of herbivorous animals. By cultivation we can change the nature, and increase the abundance, of the food supplied. But in many cases, tillage is only practicable or expedient to a limited degree, and then the natural pastures of the country must furnish the main supplies of food. In a mountainous country, where the principal food is natural herbage, and where the means do not exist of obtaining artificial food, it would be vain to attempt the rearing of a large and fine breed of oxen. We must, in such a case, be satisfied to rear a race of hardy properties, of small size, and capable of subsisting on coarse herbage. Where, again, art or the natural fertility of a country admits of supplying sufficient food, the study of the breeder should be to select a race of animals, the best that circumstances will allow him to rear.

Having fixed on the kind of breed which is the best suited to the circumstances of the district or farm, the practical question to be determined, is the manner in which a proper breed should be obtained, or the old one improved. There are three methods which may be adopted for this purpose:—

1. The entire change of the existing stock, and the substitution of a different breed, females as well as males.
2. The retaining of the old breed, male and female, and improving them by breeding from the best animals of the same breed.
3. The improving of the breed by crossing with males of a different breed.

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* They possess little of the beauty of the original stock, and are chiefly remarkable for the abundance of milk given by the cows, on which account they are great favourites with the London dairymen—the best milkers giving thirty-two quarts per day after calving, and twenty-four for the greater part of the season.—*Arthur Young's Survey of Suffolk.*

When the nature of a farm allows, the most speedy and the best method certainly of attaining the end is to change the stock, and to substitute females of the improved one from which it is proposed to breed. In this manner the purpose will be effected at once, without the labour or loss of time of improving a defective stock.

The second method is the retaining of the existing stock, and improving it by a selection of the best individuals of the same breed. This is the method which ought to be adopted if the breed already existing is sufficiently suited to the natural circumstances of the farm, and to the method of cultivation which can be pursued upon it.

The third method is that of crossing, that is, the retaining of the females, and the employing of males of a different breed. This method has often led to disappointment, from the nature of the crosses attempted, especially where the crosses have been violent, as between animals of very different characters. The first cross in general will be good, but in breeding from the progeny of this cross, expectation will often be disappointed. Not only do the good qualities of the first cross not always remain in the progeny, but often there are found in it defects which cannot be traced to the parents.

This, however, generally arises from *injudicious crossing*, and from unacquaintance with the principle on which the crosses of different animals should be conducted. When a cross is made, it should be with a male of a superior breed; and in this case the first cross will be almost always a good animal. To secure the full benefits of the cross, however, we should not too hastily resort to the males of the inferior stock, because it might be found, that, while we had injured the original breed, we had not substituted a better in its stead. The general rule, therefore, should be, to cover again the first cross with a superior male of the same breed, and so on, until the good character of that breed became permanent in the progeny. This is said to be breeding up to the superior stock.

In crossing, the essential characters of form are imprinted on the offspring by the male; and it is surprising in how great a degree this imprinting of better characters takes place, when a male of superior breeding is employed. A first cross between a short-horned bull, for example, fully bred, and a very ordinary cow, produces, not only often, but generally, a fine animal, with an extraordinary aptitude to fatten. Many of the very fat animals that receive premiums at the cattle-shows, are extreme crosses of this kind. But the benefit may end with the progeny, if we do not again cover with a male of the same superior breed, and so on until the good characters become permanent.

When a breeder, then, is to improve his stock by crossing, he ought to select a male of undoubtedly superior blood. And he should not generally, after the first cross, resort to the males of the inferior breed, but to those of the superior one, until he has formed, as it were, a breed for himself. There are, indeed, numerous cases in which a single mixture of better blood will do good, as with those inferior breeds which have no fixed characters. These will be improved by even the slightest intermixture with the blood of a better race; and a farmer who is in a district where this class of animals prevails, may safely avail himself of a good male, in the same manner as a breeder of horses would do, although the stallion were of a different character from the native stock. The cases where crossing of any kind is to be attempted with caution, are, when a breed of established good characters, or of characters which fit it for the nature of the country and the state of its agriculture, already exists.

In crossing, then, the rule is, to breed from a male of superior stock; and, fortunately, in this country we have now a breed of such established character, that no mistake can arise in the selection of males. These have been formed to our hand, with all the care that art can bestow in improving the form of feeding animals. There is no need, therefore, for those mistaken attempts at crosses which were sometimes made with males of questionable characters. We can predicate nothing securely of the progeny of such crosses as these, the effect of which will probably be to destroy the good properties of either breed, as the aptitude to yield milk of the Ayrshire, and the hardy and feeding qualities of the Galloway. But in crossing with a breed so highly cultivated as the short-horned, the breeder has the assurance that he will produce animals of large size and good feeding properties. He is to consider, indeed, whether he has the means at his command of rearing the larger animals; and if this be so, it will be better that he at once form his stock upon the best model, than run the hazard of wasting time and capital on questionable crosses.

And it must be regarded as highly important as a mean of improving the live stock of Great Britain, that a breed has been formed, by long-continued selection and care, which may always be resorted to, to effect the purposes required, in the same manner as recourse is had to horses of known pedigree, to communicate their characters to the progeny. In this manner the labours of those who have improved the short-horned breed, have extended far beyond what the original breeders contemplated. They have not only improved a peculiar breed, but have furnished the most efficient means that can be used of improving the live-stock of the entire country; and it is to be trusted that the breeders of this class of animals will have encouragement to maintain the characters of the breed with as much care as is used in the case of the race-horse, seeing that it is for a far more important end.

But having selected the breed, or having fixed on the means to be employed for forming it, a point to be determined is the manner of maintaining or improving it, by the selection of good individuals, male and female; for it is to be observed, that it is equally determined, in the case of the ox as of the horse, that the properties of the parents are conveyed to the offspring. The male undoubtedly acts the principal part in impressing his characters on the young. But the *form* of the female is of the *utmost importance;* and if we hope to arrive at success in breeding, the form and characters of the female must be no more neglected than those of the male.

Now we might breed either from animals nearly allied to one another in blood, as brothers and sisters, parents and their offspring, technically termed breeding in-and-in, or from animals of different families. By the latter method are produced animals more hardy and less subject to disease; by the former, we are frequently enabled to produce animals of more delicate form, and greater fattening properties, and above all to give a greater permanence to the characters of the parents in the offspring. It is known, that BAKEWELL and other breeders were enabled, by this system, to give and perpetuate the peculiar characters of their stock. These first improvers, indeed, found the practice to be, to a certain extent, necessary, because they could not resort to the males of other families, without employing inferior animals, and so impairing the properties of their own breed.

It is to be observed, that the breeding and continuing to breed from animals very near of blood, produces animals which have a greater tendency to arrive at maturity, and to become fat. This seems to result from a tendency to premature age in the animal, which thus more quickly arrives at its maturity, of bone and muscle, and so begins the sooner to secrete fat.

The system, however, of breeding from animals near of blood, has its limits. Nature will not be forced too far for our purposes. It is known that, although this joining of animals closely allied diminishes the size of the bones, and gives a tendency to fatten to the progeny, it renders them also more delicate and subject to diseases. Although, then, this near breeding may be carried to a limited extent between very fine animals, for the purpose of rendering their qualities permanent in the offspring, we do a violence to nature when we carry it too far. The progeny, along with their early maturity and aptitude to fatten, become feeble; the cows cease to secrete milk in sufficient quantity to nourish their young; and the males lose their masculine characters, and become incapable of propagating their race.

When, therefore, the stock of any farmer has become too nearly allied, he ought not to fail to change his males, and procure the best of the same breed. This is essential to preserve the health of the stock for any time. Great losses have been sustained by breeders who have carried the system of close breeding too far, with the design of pushing the improvement of their breed to its limits.

A character of a breed not to be neglected, is size of the individuals. Although large animals consume more food than small animals of the same species, yet they do not consume food in proportion to their greater size; and hence the benefit of rearing the larger animals, if the natural or acquired productiveness of the farm will allow it. But although size be an important element in the character of a breed, there is another property to which that of size is subordinate, namely, that of a disposition to quick fattening and early maturity. This property depends not on size, but on a different class of characters.

Form.—The principal purpose in rearing oxen, is to produce flesh. The rearing of females for milk is, doubtless, also important; but, in the great majority of cases, this purpose is regarded as subsidiary and subordinate to that of feeding.

There are certain external characters which indicate a disposition in the animal to feed, and certain characters that show that the animal has less of this property, and does not quickly arrive at maturity. These characters are familiar to breeders, and a knowledge of them is readily acquired by practice and observation. But before attending to these characters, it will be well to consider in what really consists the property of quick and easy feeding.

The flesh of an animal, it has been said, consists of muscles. A muscle is a combination of threads or fibres, bound together by a sort of minute mesh-work, to which the term cellular tissue has been applied. Each thread or fibre is divided, so far as the eye assisted by powerful glasses can discover, into smaller fibres still. A number of these smaller fibres or filaments form a fibre; a number of these fibres forms a fasciculus, or bundle of fibres; and a number of these fasciculi forms a muscle. Now, surrounding the fibres, the fasciculi, and the muscles, is the unctuous substance, fat. The same matter is formed between the muscular substance and the skin, and surrounds, or is intermingled with, the various viscera within the body. It surrounds, in large quantity, the heart, the kidneys, and other organs.

The muscular fibre grows with the animal, and is essential to its existence and power of motion. When the animal arrives at its full growth, little further addition can be made to the muscle; but it is otherwise with the growth of fatty matter. When the food which the animal assimilates by the action of its organs, is no longer needed to be converted into muscle, it is converted into fat, and this being intermingled with and surrounding the fibres, the fasciculi, and the muscles, the muscles become enlarged. By feeding an animal, then, we have little power over any increase of the muscular substance, but we have a great one over the fatty substance, which, along with the muscle, forms food.

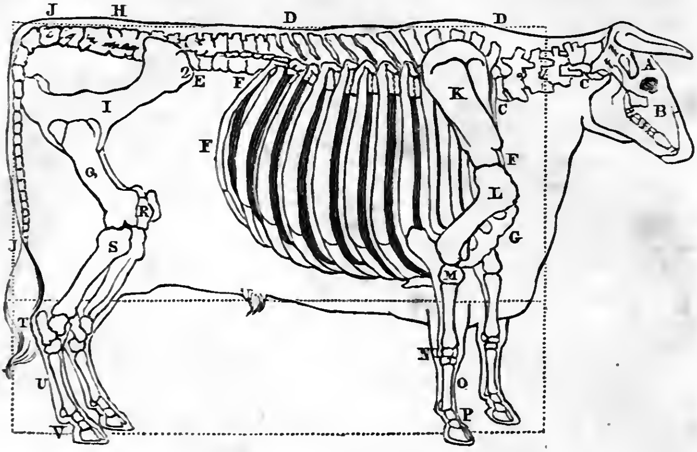
Now, an animal that arrives soon at maturity with regard to the growth of his fleshy fibre, and tends readily to secrete fat, is the kind of animal best suited to the purposes of the breeder and feeder. Such an animal is said to be a quick grower, and kindly feeder.

These properties seem mainly to depend on the power of digestion possessed by the animal. And the external characters which indicate this are a capacity of chest for containing the respiratory organs, and of trunk for containing the stomach and other viscera employed in the process of digestion. This we may infer from the effect; for, in all cases, it is found that the property of quick feeding is combined with a capacious chest and a round body. An animal of this form requires a less quantity of food to produce a given increase of weight, than one whose chest is narrow and whose sides are flat. When we look for a feeding animal, therefore, we require that his chest shall be broad, and his ribs well arched; and where this form exists, the back will likewise be wide and flat. We require, too, that the body shall be large in proportion to the limbs, or, in other words, that the limbs shall be short in proportion to the body.

Further, it is seen, that, in animals indicating a disposition to fatten, there is a general rotundity of form,—as where the neck joins the head, the shoulders the neck, and so on,—and that there is a general fineness or smallness of the bones, as of the limbs and head. The limbs being short, the neck is not required to be long, and shortness of the neck, therefore, is a character connected with a disposition to fatten.

In the case of the horse, it was seen that the body abstracted from the neck and head is comprehended within a square, the body occupying about the half of the square. But, in the case of the ox, the body is comprehended within a rectangle, as in the following figure, and the body occupies more than the half of the rectangle.

The figures given show the difference between the general form of the horse and the ox.



C C, Cervical vertebræ.
D D, Dorsal vertebræ.
E E, Lumbar vertebræ.
A, Bones of the cranium.
B, Bones of the face.
H, Sacrum or rump-bone.
J J, Bones of the tail.
F F, Ribs.
G, Sternum or breast-bone.
I, Bone of the pelvis.
Q, Os femoris—thigh-bone.
R, Pastella—stifle-bone.
S, Bones of the leg.
T, Tarsal bones, or bones of the hock.
U, Metatarsal bones of the leg.
V, Phalangeal bones, or bones of the foot.
K, Scapula—shoulder-blade.
L, Humerus.
M, Fore-arm.
N, Carpal bones.
O, Metacarpal bones.
P, Phalangeal bones.
2. Hip-bone, huckle or hook-bone.

In the one case, there is the outline of an animal fitted for speed; in the other, of an animal with great bulk of body, and unfitted for active motion. The horse, which occupied too much of the square, would be regarded as of bad form. In the ox, the more of the rectangle which the body occupies, the more does the form approach to that required by the breeder.

The tendency to early growth and kindly feeding is likewise indicated by the touch. This property is known to graziers and breeders, who are all familiar with the soft and delicate feel of a good animal. They call it a mellow feel, the meaning of which it is more easy to conceive than define. It is a certain softness combined with elasticity of the skin. The difference between the skin of a coarse animal and one possessing the peculiar softness here referred to, can, by a little practice, be easily discriminated.

The same characters which indicate a disposition to fatten in the ox, indicate it in the other domesticated animals. The fineness of the bones,—the largeness of the body as compared with the limbs, neck, and head,—the broadness of the chest,—the roundness of the body,—and the soft and elastic touch,—indicate in all cases this property.*

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* The following are several of the popular characters which are generally given as indicating the feeding powers of the ox:—1. The head should be fine and tapering to the muzzle, which should be thin. 2. The neck should be

Rearing and feeding.—The period of gestation of the cow is about 40 weeks, varying somewhat according to the constitution of the animal. She is sometimes capable of receiving the male during her first year, but he should not be admitted to her until after she has completed her second year.

Some time after having produced her young, the cow manifests a desire to receive the male. This continues for a few days, and returns at intervals of a fortnight or three weeks. When the male is admitted to her, she is generally at once impregnated. Should this not be so, the instinctive desire returns, and she must again be taken to the male until she has been impregnated, which is known by the ceasing of these periodical returns.

It is important to the breeder of feeding cattle that the calves should be born early in the season, so as to afford the means of bringing them well forward upon the summer grass. The proper season for calving is in the months of January, February, and March. When the period of producing the young has arrived, the cow is to be attended to with care, kept in the house, and the birth of the young waited for and assisted when necessary. The position of the fœtus is with the head couched between the fore-legs. When it is otherwise the birth is more difficult, and generally the calf must be turned into the proper position. This is done by the hand, the cow being laid on her side, and gently raised from behind by hoisting. But in general the parturition of the cow is easy.

The calf, on being born, is to be carried away and placed loose in a pen or crib with clean dry litter. The cow should not be suffered to touch or recognise her young, as this only tends to render her uneasy and distressed by the separation. The cow should then be milked and fed with some nourishing food. A sheaf of barley answers the purpose very well, and some nourishing gruel should also be given. An excellent food for some time previous to calving, and some time afterwards, is linseed boiled, or bruised oil-cake dissolved in warm water.

In mountainous countries the cow may be permitted to suckle her calf during the months of summer; and a practice similar to this is frequently adopted with the breeds of the plains. But where a good breed of cows exist, the young should at once be separated from the dam and fed from the pail. The first milk drawn from the cow is viscid, and is peculiarly fitted for the nourishment of the young; for which reason each calf should first be fed by the milk of its own dam.

The quantity of milk given to the young animal should be as much as it can consume, which will be found to be somewhat more than a wine gallon in the day. The quantity which it can consume, however, will gradually increase to 2 gallons more, or 3 gallons in all; and this feeding may be continued for 12 weeks, when the animal is to be put into the course of being weaned, and in one month more completely weaned. The milk given to the calf is new milk, that is, milk directly from the cow. The milk, however, may be economised, by employing substitutes to a limited extent, and, in this manner, the milk of one cow be made to rear more than one calf. The best substitutes are farinaceous food, as meal and porridge. Linseed or oil-cake can be given; by using

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free from coarseness, large where attached to the shoulder, and tapering to where it joins the head. 3. The breast should be wide, and projecting well in front of the fore-limbs. 4. The shoulder should be broad, but joining without abruptness to the neck before, and to the chine behind. 5. The back and loins should be straight, wide, and flat. 6. The girth behind the shoulders should be large: the ribs should be well arched, and the distance between the last rib and the hook-bone small. 7. The hook-bones should be far apart and nearly on a level with the back-bone: from the hook-bone to the rump, the quarters should be long and straight. 8. The belly should not hang down; the flanks should be well filled up; the legs should be fleshy to the knee and hock, but below the joints they should be tendinous. The tail should be on a level with the back, broad at the top, and tapering to near the extremity. The hoofs should be small; the horns fine and pointed, and slightly attached to the head; the ears thin; the eyes prominent and lively.

a little of these dissolved in the milk, its nourishing properties may be increased to any degree required. The calf should be fed three times in the day, regularly at a fixed hour.

After twelve weeks, the use of new milk may be given up and skimmed milk substituted, making it lukewarm, and the quantity gradually lessened; and in the course of one month more, that is, in four months in all, the animal may be entirely weaned.

This indeed is more liberal feeding than is usually deemed necessary; yet it is a great error to stint animals in their food at this age, with the view of economising milk. It is from this cause that so many stunted animals are to be seen in the hands of breeders and farmers, that never afterwards attain to a good size, nor acquire a disposition to fatten.

During the period of feeding with milk, the animals will be taught by degrees to supply themselves with food. For this purpose, when the season is not sufficiently advanced, a bunch of sweet hay, or any green herbs, should be placed within reach of the animals; and a little salt may be given, which they will soon learn to lick, when placed beside them. If the weather allows, they may be turned into a yard for a few hours in the day, and after a time, when the weather becomes mild, into a little paddock containing sweet grass, housing them at first at night, until they shall be fully hardened to the air.

The males, when not intended for propagating, may be castrated when 30 days old. The operation is easily performed, by two incisions with a sharp knife. An analogous operation, termed spaying, is sometimes performed upon the female, when she is intended for feed; but the more approved practice is to preserve her entire.

The weaning of the calf, it has been said, may take place at the end of four months. The calf is then merely turned into good pasture during the remainder of the season, and fed like the other stock, and generally along with the cows or feeding oxen; and, as in the case of all growing animals, it should be allowed ample food.

The subsequent treatment of calves necessarily depends upon the nature of the farm, and the species of food which can be supplied. Where there is nothing but coarse pastures and inferior hay, and when no roots or cultivated forage can be raised, then the stock of the farm must be suited to these circumstances.

In cases where no other food can be supplied than the natural produce of the farm, the same care and delicacy in rearing are not necessary or practicable, as under a more artificial system of feeding. The cows, in such cases, are usually permitted to suckle their young. During the first winter, the young animals receive such pasture and natural hay as the farm affords. In the following summer they are kept on the coarse pastures of the farm; in the following winter they are maintained as in the former one, and so on until disposed of to the feeder, which may be in the second or third, or even sometimes the fourth, year of their age. The sooner cattle, under these circumstances, can be brought to maturity, the better is it for the interests of the breeder.

The system of breeding, however, where the nature of the farm is such as to afford a supply of proper food to the animals, and where the finer class of stock is kept, is altogether different. In this case, the principle of the system followed, is to afford a full supply of food to the animal, from the birth to the time that it is transferred to the butcher. This principle applies to all animals intended to be fattened.

The calves, after being weaned, are put, it has been said, on good pasture, and fed for the remainder of the season. When the herbage fails in autumn, the animals should be put in straw-yards, with sheds, into which they may retire for shelter. The number put into one division or yard should not be too great, though this is less important at this period of their life than afterwards. Calves to the number of 20 may be kept together in one yard, provided they have plenty of room; but when animals are of a large breed, it is better that the number should not exceed 10.

The yards should have pure water in each, conveyed to them by pipes, and retained in troughs, to which the animals can have access at all times. Each yard should have, along one at least of the sides, shallow troughs, formed of wood or stone, for the purpose of holding roots, and similar food. The yards should be so dry, that the animals may not be incommoded. The arrangement of these yards, with their sheds, will be seen in the design of farm buildings afterwards given. Before bringing the calves home for the winter, the yards should be bedded with a layer of coarse straw, or dried stems of plants of any kind. In the middle of each of these yards should be placed one or more racks for containing straw, and preventing its being strewed about. The best kind of straw is oat-straw, and the rack should be kept constantly supplied.

A quantity of turnips (for this we may suppose to be the species of green food used) must be put into the troughs in the morning; again a quantity at mid-day; and, lastly, a quantity in the evening, before night-fall.

The calves must receive a full allowance of turnips, that is, they must receive as large a quantity as they can consume. At the same time, the racks must be kept always filled with straw, and some litter sprinkled, wherever necessary, over the yards, so as to keep them dry. When straw fails, hay must be supplied, and in place of turnips, should these also fail, potatoes or other succulent food.

In the month of May, generally about the middle of it, in the northern parts of this country, but several weeks earlier in the more southern parts, the pastures will afford sufficient food for the young stock, which have now completed their first year, and are, in the language of farmers, yearlings, or one-year old. Until the grass is fully ready, the animals should on no account be turned out to the pastures, and care must be taken that the grounds are not overstocked, lest the animals be in any degree stinted in their food. They should at this period be gaining fat as well as growth; and no greater error in the management of feeding cattle can be committed, than to allow their progress to be in any degree checked by the want of sufficient food.

After pasturing for the summer, and at the same period as in the former year, namely, before the end of October, the animals, still yearlings, are taken up from grass.

In the case of the finer breeds, the animals may now be prepared for the butcher; for which they will be ready in the following spring, after being fully fed during the winter, or after having received some grass during the following summer. This is the perfection of rearing and feeding oxen, and the practice shows how great must be the superiority of a breed that can be fattened at this early age. It is only, however, the finer classes of animals, and that under a perfect system of feeding, that can be thus early matured. The more common case is, that they require one winter's feeding more before they are ready for the butcher; and it will be better, therefore, to proceed upon this supposition in describing their further management.

The year-olds, then, are to be taken up from grass as soon as the pastures begin to fail in October or November. They are put into yards with shelter-sheds as before; but, in place of 20 in a yard, there should not be more than 10, the animals being now larger of size, and more apt to interfere with one another in feeding; and they are to be treated in the same manner as during the first winter. They are to be well littered, to be fed three times in the day with turnips, and to receive their full allowance of straw.

It must be observed, however, that this is the period in the age of the animal at which a slight relaxation may be made in the system of full feeding—not that it is well to relax in any degree, but that in practice, with the common supply of food which can be obtained on a farm, it is frequently necessary to do so. But wherever food can be obtained to carry on the system of full feeding during the second winter as during the first, it should be done; for the importance is very great of keeping the animals not only growing, but fattening, from their birth to their full maturity. But if the feeder is unable to carry on the same system of feeding during the second winter as during the first, he may limit the quantity of succulent food, as to the half of the quantity of turnips which the animals, if unrestricted, would consume; giving, however, in all cases, an unlimited quantity of dry provender. In general, however, the necessity for the reduction of the quantity of the richer food is much less than is supposed, for if substitutes for the turnip cannot be obtained, the quantity of stock may be reduced to the means possessed for carrying it on in a proper manner.

In all cases, then, the study of the feeder, must be to carry on the feeding animals with a full allowance of good food from their birth to their maturity. But the period at which he can relax a little in this system of full feeding, and substitute more common provender, is in the second winter. Yet even while he does relax to the extent of diminishing the more feeding food, he must take especial care that the animals, if they shall not gain fat, shall lose no part of their former condition. It is opposed to all the true principles of breeding to allow animals to fall off from the condition at which they had arrived.

It is not necessary, however, after the first winter, to give the same high feeding to the females intended for breeding, as to the males. The object proposed with the females intended for breeding, is not to render them fat, but to maintain them in a healthy and growing state. This is to be done, not by giving them a full allowance of the richer food, but such a portion of it only, as, joined to the more common provender of the farm, will maintain them in a healthy state. When the yearling steers are to be carried on during their second winter, on a modified, and not a full allowance of richer food, then the heifers need not be separated from them, because both are to be fed in the same manner; but when the steers are at this time to receive full feeding, then the heifers are to be put into a yard with a shed by themselves. They should not be tied to stakes, according to the common practice, but kept in yards with sheds. In the following summer they are pastured along with the older cows, and receive the male as soon as they are ready to do so, which, in the case of heifers, is later than in that of older cows. When winter comes, they are to be put into their separate pen again, and fed as in the first winter, and when within a few weeks of the period of calving, they may be tied up gently in their stall, or be put into a separate box.

But to return to the feeding stock:—The yearling steers are fed in their yards, either with their full allowance of straw and green food, or else with a full allowance of dried provender, and a modified allowance of green food. By the month of May they have completed their second year, and are now termed two-year-old steers. When the pastures are fully ready for them, they are turned out to feed, and are kept in these pastures until the herbage fails in autumn, when they are to be taken up once more and fed on green food in the fullest quantity in which they can consume it.

Two methods may be adopted in this final feeding of the animals. They may either be tied in the house, having a trough or manger to feed from, or they may be kept in small yards, with open sheds attached.

In the first case, that is, when confined to the house, and fed from a trough or manger, the animals are tied by the neck to upright posts. The best method of attaching them is by a light chain, which encircles the neck, and is fastened to a ring, moveable upon a stake. In this manner the animal has the power of raising and lowering his head with such freedom as permits him to lie down.

But instead of a series of upright posts, it is better that each animal have his own stall. A partition of wood at the heads of the oxen, or, a very good substitute, a broad stone, is placed between each animal. A bar of iron is then fastened to the stall, with a ring moveable upon it, to which is fixed the chain which goes round the neck of the animal. In this manner each ox is prevented from interfering with the provender of his neighbour, in the manner shown under the head farm-buildings.

The other system of feeding is in small yards, with sheds. Each shed with its yard should be of a size to contain easily two oxen, or, if it is made of a size to hold four oxen, there should be a division between each pair, so that more than two shall not be together; and in the open yard, and close to the wall, should be fixed troughs for holding the provender.

Under this system of feeding, the animals have more freedom than when fed in close houses; and that moderate exercise, which, without impeding their fattening, tends to keep them in health. They receive the benefit of the sun and air, and have always the shelter shed to retire to. They have the power of going to their food at all times, even during the night, and this food being in the open air, is kept always fresh. The treatment of the cattle, too, in these sheds and yards is easy, and the injurious effects to the animals obviated of any deficient ventilation, or any want of care in the management. And experience has fully shown that the finest animals may be fed in these sheds, better even than in the warmest house, when they are tied to the stake.

But the latter practice of feeding is the more common; and it is the most necessary, too, to be described, because it requires greater attention on the part of the keeper.

When the cattle are for the first time to be fixed to their stakes, some care is needed to induce them to go forward. Gentle means must be employed; they must be somewhat tightly tied at first to prevent their turning round; and watched for a time, lest they injure themselves by struggling. They must be well littered, and the turnips placed in the low manger of the stall before them.

Early in the morning the first operation to be performed is, to remove the dung from behind the cattle, and to place the turnips in the stall, the stems and tap-roots having been previously cut off. While the cattle are feeding, the dung is to be wheeled out of the house, and deposited in the yard or dung-pit. When the turnips are eaten up, a little good oat-straw or hay may be placed before the animals; and they being now littered, will soon lie down and chew the cud.

At mid-day they are again to be fed as before, and again before sunset, a little provender of hay and straw being placed before them after each meal; and finally, the keeper, before retiring for the night, is to examine them with a light, see that all is right, stir their litter, and place a little hay or straw before them. Under this system the oxen will be fully fed, and induced during the intervals of feeding to lie down, and left to repose during the night; or they will take a little dry food, should they be inclined to feed. Early in the morning the same process recommences; and the utmost regularity is to be observed in these operations, for the animals know the precise time of feeding, and become restless when it is not observed. Careful feeders currycomb their cattle in feeding, and in all cases observe that the skin is kept free from vermin, or other impurity.

Frequently the turnips are cut into slices by the turnip-slicer. This, though not essential, is very beneficial, by enabling the animals to take the turnips more easily into their mouths, and masticate them. In spring the white turnips decay, and then there should be a succedaneum, first of yellow, and next of Swedish, turnips, which last retain their juices the latest in spring.

If the animals are kept in the yards with shelter-sheds, the principle of feeding is the same as that described; but the dung in this case is not removed from the animals, the litter being spread above it.

An ox of 50 or 60 stone weight will consume about a ton of turnips in the week, or about an acre in 24 weeks. If he thrive well, he will gain in weight 14 lbs. or more in the week.

Sometimes cattle, especially when tied to the post, are apt to be choked by a piece of turnip sticking in the throat. In this case, the common practice is, to endeavour to push the piece of turnip gently, but firmly, down into the stomach by means of a flexible stalk, terminating in a round bulb of wood or bone.

The feeding with turnips is the most simple and economical method practised in this country. Turnips, however, cannot in all cases be raised in sufficient quantity, and in some cases they cannot be produced at all, and then, if a system of feeding is to be carried on, recourse must be had to other substances.

Mangel-wurtzel, the carrot, the parsnep, and the cabbage, are all suited to the purpose of feeding; and the manner of consuming them is so similar to that of the turnip, that when the mode of applying the one is known, that of using the others is easy.

Potatoes are also a nourishing food for ruminating animals. When given raw, they are applied in the same manner as the turnip; but care should be taken to begin somewhat gradually, because this food is apt to scour and injure cattle at first. Potatoes and turnips may, with great advantage to cattle, be given at the same time. Different kinds of food seem to have an exceeding good effect in promoting the tendency to fatten of all cattle; and in the case of feeding with potatoes and turnips, one meal of the former, and two of the latter, in the day, will be found to be a good arrangement. Potatoes steamed may be given to oxen; but steamed food is never of the same advantage to ruminating animals, as to animals with single stomachs, as the horse and the hog.

Bruised corn and meal are occasionally employed in feeding; but these are expensive, and only subsidiary to more common food.

Another species of feeding is the refuse of the distillery. This consists of the grains of malt after distillation, and of the wash or liquid refuse, and wherever these can be obtained, they may be applied to the feeding of cattle with success. They form a very nutritive food, rejected often at first by the animals, but afterwards consumed by them with eagerness. The grains may be given at the rate of from a bushel to a bushel and a half in the day, with a proper supply of dry food; the liquid portion, or wash, is drunk by the animals. The refuse of the brewery is in like manner used for the fattening of oxen.

Oil-cake is one of the substances employed in feeding. It is highly nutritive, is greatly relished by cattle, and it never fails to increase their tendency to fatten when given with their other food. It may be given in quantities of 2 lbs. or more in the day, along with any other food. It is frequently given with hay alone, and the quantity that will feed an ox, is from 12 to 15 lbs., with half a stone of hay in the day; but this is an expensive feeding, and the better mode of using oil-cake is to give it in small quantities, with less costly provender. It may be given with great benefit along with turnips. In this manner the turnips upon a farm may be economised, and a much greater number of animals matured upon it than would otherwise be practicable.

Salt should be given to feeding animals. The use of this universal condiment in the feeding of oxen, has been known from the earliest times. The quantity given may be from 4 to 5 oz. in the day to old oxen, to yearlings from 2 to 3 oz., and to calves ½ oz. All oxen will soon learn to take it if placed within their reach.

The general method of feeding oxen in this country in summer, is in the fields in the manner described; and this is the more simple and easy method, and that which is the most likely to be generally followed in a country abounding in pastures. The practice of soiling, however, has been often recommended, and partially adopted, in the feeding of oxen. But this has usually been in favourable situations with respect to productiveness of the soil. It is not a practice well suited to very young stock, which require moderate exercise, and do not grow so well when kept and fed in this manner, as when allowed to pasture in the fields. Soiling, therefore, when it is practised in any case, should generally be confined to the older stock, at the period of their final feeding.

The best method of keeping oxen, when soiled, is in the same small sheds and yards as are employed for feeding on turnips. The food must be carried home, and given to the cattle from racks, in moderate portions at a time. They must be fed three times, and may be fed four times, in the day; and they should be kept carefully littered. Between the period of consumption of the first crop of clover or other green forage and the second, there is sometimes an interval. At this time, therefore, there must be a supply of other food, as of tares, which, if sown in the preceding March, will be ready at this time, and will carry on the cattle until the other forage is ready for being cut a second time.

The rearing and feeding of cattle has been described from the birth to the maturity of the animals; but deviations from the modes described necessarily take place:—The breeder, in the case of certain farms, is not the feeder: He merely rears the animal to the maturity of age, or degree of fatness, which the nature of his farm allows, while other persons complete the process of feeding, in the manner which their peculiar situations render profitable or expedient.

The hardier breeds of the mountains are in general request for being fed in this manner. They are generally purchased lean before winter, and taken to all parts of the low country. They are there fed on straw, or coarse natural hay, during the first winter, with merely such an allowance of green food as can be spared; and they are either grazed and fattened in the following summer, or fed for another winter and summer, as suits best with their age and condition.

And not only the mountain breeds, but lean cattle of all kinds, in a more or less advanced state of age and fatness, are in the course of being transferred; and a great part of the profit of farmers depends upon the skill with which, on the one hand, they make their purchases, and, on the other, effect their sales of stock.

Calves, instead of being reared to maturity in the manner described, are frequently disposed of in a fattened state when young. The calves, under this system, may be transferred soon after their birth to the butcher, or they may be fed for a longer period on milk. In the latter case, they are rarely good veal in less than 5 or 6 weeks, and the most approved period for keeping them is 10 weeks. They are fed liberally on milk; but linseed cake and other feeding substances may be also employed. The cribs in which they are kept should be perfectly dry, well littered, and ventilated.

Weight of oxen.—The parts of an ox to which the term *offal* is usually applied are the head and feet, the tallow, the hide and horns, and the entrails.

The fat of an ox, it has been said, is that unctuous substance which is intermingled with, and surrounds, the muscles and other parts. That which grows internally is mostly termed tallow, from the uses to which it is applied. The tallow is generally considered to be of the same value, weight for weight, as the flesh of the fore-quarters; and so likewise is the hide. These and the other parts, termed offal, are commonly regarded as forming about one-fifth of the value of the animal. When beef is said to be sold at a certain price *sinking the offals*, the meaning merely is, that the whole price of the animal is reckoned upon the carcass alone; hence, when beef is sold at a certain price sinking the offals, that price is more than if it were sold without including in it the price of the offals.

That portion of the ox which is used for food, exclusive of the offals, is usually termed the quarters, because the animal, on being cut up, is divided into four parts or quarters. The most esteemed parts for food are the hind-quarters. These weigh somewhat less than the fore-quarters; though the more perfect the form of the animal is, the more nearly do the fore and hind-quarters approach in weight.

Practice enables persons to judge of the weight of animals by the eye alone; but it is convenient to be able to ascertain the weight by measurement. This may be done with considerable correctness in the following manner:—When the animal is standing in a natural position, measure his length in feet from the foremost upper corner of the shoulder-blade in a straight line to the hindmost point of the rump; then measure the girth or circumference immediately behind the fore legs; multiply the square of the girth by the length, and this product by .238, which will give the weight of the quarters in stones of 14 lbs. each. This rule has been arrived at, by regarding the body of the animal as a cylinder, and determining, by experiment, what proportion, on an average, the actual weight of the quarters of animals bears to the cylinder.

Another method of ascertaining the weight of fat cattle, is, by weighing them when alive, and multiplying the gross weight by .605.* This rule has been arrived at, by determining, from an average of cases, what proportion the dead weight of the four quarters is found to bear to the living weight of the animal.

Diseases of oxen.—The diseases of the larger ruminating animals are not of very frequent occurrence, although they are often dangerous and fatal.

A malignant distemper, termed murrain, has sometimes made dreadful ravages among the cattle of many countries, returning for successive years to the same country, and sweeping entire generations of cattle away. In the early part of the 17th century, it long raged on the continent of Europe, and when it visited this island, continued its ravages for many years. But happily, since the period of its first introduction, its occurrence has only been partial and local.

Cattle are subject to inflammatory diseases, which receive various names, as quarter-ill, black-quarter, showing-of-blood, &c. Bleeding at the commence-

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* Paper in Quarterly Journal of Agriculture by Mr. Fergusson of Woodhill.

ment of these diseases is proper; but the subsequent treatment depends upon the stages of the disease at which the remedies are applied, and other circumstances.

Cattle are subject to colds, which frequently terminate fatally. Colds are brought on, amongst other causes, by sudden changes of temperature, whether of the atmosphere or of the place of feeding of the animal. Bleeding may in most of these cases be proper, and in all cases shelter should be afforded, and warm food supplied, as mashes, boiled turnips, and the like.

Cattle are subject to different diseases, which receive the general name of cholic, or gripes. Diarrhœa and dysentery are also diseases of cattle, and many diseases might be mentioned; but it would be of no avail to enumerate them, without entering into lengthened details.

In general, what falls within the province of the farmer may be comprehended under the head of food and general treatment. The medicines which he should venture to administer should be cautiously given. Where violent inflammatory diseases attack the animal, he may always venture to bleed in the first stage; when costiveness occurs, he may administer some laxative medicine; when diarrhœa or looseness occurs, he may give some laudanum, and in all cases mashes of boiled or steamed food. The bleeding of the ox, it is to be observed, should always be large. It may be continued until the animal appears to stagger, but then, or whenever the pulse is affected, it must cease.

One of the most frequent diseases of cattle, with regard to which the farmer has to act upon the instant, is hoven, or inflation of the rumen. The paunch, or first stomach, of ruminating animals, is of large size, and as the green food which is taken into it is frequently charged with moisture, the stomach is not only overloaded, and unable to carry on its functions, but the mass fermenting, air is generated, by which the stomach becomes so distended, that either a rupture of it takes place, or the animal dies of suffocation. This disease most frequently occurs when animals are turned into rich succulent pastures, particularly of clovers, when charged with the morning dews.

Sometimes powerful stimulants are given to assist the action of the stomach, and these are often sufficient; or a hollow flexible tube is introduced into the stomach through the mouth, that the air may be permitted to escape. Should this operation not succeed, then an opening must be instantly made through the left side into the paunch. This is usually done by a pen-knife, while a quill, or something similar, is introduced, to allow the air to escape. But recently the stomach-pump has been employed for this and other diseases, and with the best effects. It is fitted to withdraw instantly the contents of the stomach, and also to inject liquids, so that, when the mass of the stomach is too hard, the matter may be first diluted by injected liquids, and then withdrawn. The stomach-pump is also suited to various diseases of the horse, and may be formed of smaller size for the sheep; so that by means of this instrument, the lives of many valuable animals may be saved upon a farm.

III. THE SHEEP.

The sheep is, perhaps, all things considered, one of the most valuable animals given to man by a beneficent Providence. No animal is of greater utility. Inhabiting almost every part of the globe from Iceland to the torrid zone, sheep not only supply food and clothing to the tens of thousands of persons who cultivate and rear them, but the wool they afford sustain in active employment large and extensive manufacturing establishments, thus contributing in large proportion to the productive labour, the commercial prosperity, and the wealth or opulence of various countries. Existing in such a diversity of climate, the varieties of their form and clothing (fleeces) is necessarily greatly varied. They are generally cultivated for their wool or flesh; in some countries—the United States for instance—for both.

The history of the sheep is one of no little interest to the naturalist. The earliest scripture records refer to the antideluvian breed—"ABEL brought the firstlings of his flock;" and again, ABEL became "*a keeper of sheep*, and CAIN a tiller of the ground."* There is no record to prove that sheep were at this early period used for food, and this opinion is strengthened by the fact that all ancient history is uniform in asserting, that, in the golden or antideluvian age, the use of animal food by man was unknown; and we have no direct evidence in the scriptures that this use of animal food by man, was divinely sanctioned until after the deluge. When man, by his own voluntary act, became an outcast from Paradise, the curse pronounced upon him for his disobedience was—"Cursed is the ground for thy sake. In sorrow shalt thou eat of it all the days of thy life, and thou shalt eat the *herb of the field*—in the sweat of thy face shalt thou eat *bread.*" But mark how different is the language addressed to NOAH *after* the flood. "Every moving thing that liveth *shall be meat for you.*"†

At what period the grand improvement in the management of the sheep—the periodical separation of the wool from the pelt—the shearing—was first introduced, is unknown. The earliest and oldest process was to drive the flocks rapidly through a very narrow passage, when by their pressure against each other, the greater part of the fleece was loosened, or completely detached. The *falling* of the fleece was early observed, and when, before the invention of shearing, wool had acquired a high value, a singular, but most inhuman method was generally resorted to, in order to loosen the wool so that it might be torn from the sheep nearly in one bulk. For this purpose the poor creatures were confined for several days without food, or until they were in a state of great debility,

* The account of the posterity of CAIN, advances the history of the sheep another and an important step. We read that "ADAH, the wife of LAMECH," one of the descendants of CAIN, "bare JUBAL; he was the father of such as dwell in tents and have cattle"—or as it should have been rendered, "with cattle." The reader will observe here the use, for the first time, of the word *cattle*, which so frequently occurs in the after history of the Patriarchs. It is pleasing to connect with a descendant of CAIN—CAIN the fratricide—and as a proof that the curse did not rest forever upon his offspring, the first mention of the domestication of other animals, almost as much connected as the sheep with the subsistence and comfort of man.—*History of the Sheep.*

† Gen. iv. 2, 4

and the fibres of the wool, sharing in the general weakness and derangement, was the more readily detached from the skin.*

Some authors have imagined that the production of wool was confined exclusively to sheep; but practical men, however, know that there is a large class of animals on whom, at some season of the year at least, wool is found. The *under hair of some goats,* is not only finer than the fleece of some goats, but has the crisped appearance of wool—it is in fact wool, but of different qualities in different breeds. On many species of the *deer* (undomesticated) wool is found at the roots of the hair. Fine and valuable wool is produced on the *yak* (ox) of Tartary and the *musk-ox.* A species of animal between the antelope and the ox, the *gnoo,* has mixed with, and filling up the interstices between the hair, a considerable quantity of wool. The camel has wool at the base of its long hair. The *hare,* the *rabbit,* the beaver, and many other fur clad animals bear upon them a variable quantity of wool.

It is supposed that the external coat of the first sheep was probably hair, and that it has been brought to its present state or condition by change of climate, careful and attentive culture, the kind and quantity of nutriment, and other circumstances. This seems to be the opinion of Dr. ANDERSON, Sir JOSEPH BANKS, and Mr. PLINT. If they are correct—and we see no good and sufficient reason to doubt—the change from hair to wool must have been gradual. The selection of those animals for breeding, which yielded the finest wool in the greatest quantity, was no doubt an object of moment to the early shepherds—an adherence to this, would, in the course of time, have produced a breed bearing wool only.

The *Yolk.* The filament of the wool has scarcely pushed itself through the pore of the skin, than it has to penetrate another and singular substance, which, from its adhesiveness and colour is called the YOLK; it abounds about the breast and shoulders, the very parts that produce the best and most abundant wool—and in proportion as it extends, in any degree over other parts, the wool is there improved. The quantity varies in the different breeds—the southern sheep have a sufficiency of it both for the production of wool, and to guard them from the inclemency of the weather. It is more abundant on the true merino than any other breed. Where there is a deficiency of yolk, the fibre of the wool is dry and harsh, and weak, and the whole fleece becomes thin and hairy. Where the natural quantity of it is found, the wool is soft and oily, and plentiful and strong. In northern districts where the cold is intense, and the yolk of wool is deficient to shield them from the weather, a substitute for it is sought by smearing the sheep with a mixture of tar and oil, or butter, eleven parts of oil or butter to one of tar.—*Sheep Husbandry*, p. 60.†

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* History of the Sheep, Farmer's Series, p. 64.

† This process of smearing will answer to some extent where the climate is dry; but where it is moist, and the rains are frequent and heavy, it will not answer, and should never be attempted. A gentleman of great respectability, whose flock of sheep numbered more than seven thousand, informed the Editor of this work, that he tried the experiment on about one thousand of his

A celebrated French chemist, M. VAUQUELIN, from a vast variety of experiments on the composition of the yolk of wool, arrived at the following results. It is composed—1. Of a soapy matter with a basis of potash, which formed the greater part of it. 2. A small quantity of the carbonate of potash. 3. A perceptible quantity of the acetate of potash. 4. Lime, whose state of combination he was unacquainted with. 5. An atom of the muriate of potash. 6. An animal oil, to which he attributed the peculiar odour of the yolk—and, in conclusion, he was of opinion, that all these materials (in their several proportions) were essential to the yolk, and not found in it by accident, for he analysed the yolk in a great number of samples, as well Spanish as French, and found them in all.—*Annales de Chimie, An.* xi. No. 141. The yolk being a true soap, soluble in water, it is easy to account for the comparative facility with which sheep that have the natural proportion of it are washed in a running stream. But there is, however, a small quantity of fatty matter in the fleece, which is not in combination with the alkali, and which, remaining attached to the wool, keeps it a little glutinous notwithstanding the most careful washings.—*Luccock on Wool.*

The fibre of wool is of a circular form, varying in diameter in different breeds and in different parts of the fleece of the same animal. It is generally larger towards the extremities. It presents this appearance after having penetrated the skin and yolk. BAKEWELL says that the filaments of white wool, when cleansed from grease, are semi-transparent, their surface in some places being beautifully polished, in others beautifully encrusted, and they reflect the rays of light in a very pleasing manner. When the animal is in good condition, and of course yielding a healthy fleece, the appearance of the fibre, when viewed by the aid of a powerful microscope, is really brilliant; while from the wool from sheep of ill condition, or half fed, a wan, pale, sickly light is reflected. Mr. LIVINGSTON, of New York, has made the same or similar observations in regard to wool. Mr. YOUATT, in his History of Sheep, says that Mr. LUCCOCK speaks of some breeds in which the pile is flat and smooth, like a small bar of finely polished steel.

The properties of wool are various—the most important are fineness of pile—purity—proper length of staple—elasticity—colour. "The property which first attracts attention, and which is of greater importance than any other, is the *fineness of the pile,* the quantity of fine wool which a fleece yields, and the degree of that fineness. Absolute fineness varies to

sheep; the weather immediately following was wet; and out of the thousand so treated, he lost more than seven hundred, with what he termed the *skin-rot.* He said the application, so far as he was capable of forming a judgment, arrested the *natural perspiration* of the animal, which being once checked could not be restored, and the poor sheep died in the greatest agony. The remainder of his flock continued in good health—the *disease,* if such it can be called, was not contagious. We should suppose that the free application of this mixture would have a tendency to impair the quality of the wool, and consequently to reduce its value in the market. Professor Low, however, recommends this smearing of sheep before winter in very elevated or cold countries. He advises the butter to be boiled, and a little milk mixed with it; six pounds of butter to one of tar, thus prepared, will be sufficient for twenty sheep.

such an extent, even in the same fleece, that of it nothing can be said."* The fineness of the wool differs greatly on different sheep, and equally on different parts of the same sheep. The wool on the side of the neck and covering the shoulders, the ribs and the back, is considered the finest. The next covers the superior parts of the legs and the thighs, and extends up to nearly the haunch and the tail—and a still inferior portion runs along the upper part of the neck, the throat, the breast, the belly and the lower part of the legs.† Temperature and other causes affect in an especial manner the fineness of the pile—pasture, and the general feed and management of sheep, exert a far greater influence on the fineness and the quality of the wool than any thing else.‡ The more equal in quality the wool is on all parts of the body, the greater is the value of the animal that carries it.

Connected with fineness is trueness of staple—as equal a growth as possible over the animal—a freedom from shaggy portions, here and there, which are occasionally observed on poor and half-kept sheep. Allied to trueness of fibre is a freedom from coarse hairs which project above the general level of the fleece in various parts. The term also implies a freedom from those irregularities in bulk of the fibres of the wool, which render it difficult at times to give it a definite name or character.§

Soundness, as connected intimately with trueness, or purity of staple, means strength of the fibre generally. This is an important property, and is considered indispensable in long wool. The fleece deteriorates in consequence of age; the wool is also liable to injury by felting, while remaining on the back of the animal; which is the case with heavy breed, but more especially those that are only half kept. Mr. Parkinson notes two diseases of wool; if they really exist they should be termed *defects.* That which sets thinly on the pelt, he terms *feathery*—and the other defect *watery* wool. "It is so full of grease it looks damp."

Softness of pile is a most desirable quality in wool. Wool is necessarily subject to numerous manipulations, and the judicious manufacturer invariably gives the preference to that which is soft, pliable, and elastic. In the opinion of the best judges the pile cannot be too soft and silky, provided the strength thereof is not impaired; and it is stated in the Far-

* Luccock, pp. 178, 179. † Sheep Husbandry, p. 66.

‡ The wool of sickly or murrain sheep is generally not only finer than in a healthy sheep of the same breed, but it possesses this tender quality not to be detected by the eye, nor even by the microscope—unless that it may be suspected by a slight degree of polish, and not having so round and full or plump appearance.—*Parkinson on Live-Stock.* § Ibid.

mers' Series of Useful Knowledge that two packs of sorted wool being taken, possessing the same degree of fineness, but the one having the soft quality in an eminent degree, and the other being harsh, the cloth prepared from the first, at the same expense, will be worth more to the manufacturer than the other by full twenty-five per cent. The cause of this peculiar softness of pile, and the proper means by which it may be increased, are not fully known; but it is reasonable to suppose that the quality of softness is dependant, in a great measure, on the fineness of the fibre; the yolk, therefore, as it gives richness and pliability, as well as nourishment, to the wool, exerts some influence in promoting the softness of the pile. Every farmer who has a flock of sheep should pay special attention to the quantity and quality of that cardinal point in sheep, the yolk. Bad management, or poor keep, by arresting the secretion of the yolk, or changing its properties, will, in a very great degree, impair the pliability of the woolly fibre.

The *colour of wool* is of minor, and yet of no trifling importance, according to YOUATT, who says that the alteration of the colour was the first recorded improvement in the sheep—and its purity, its perfect whiteness, should never be lost sight of in the present day. It must, however, be confessed that the breeder is not, in every respect, as careful as he ought to be. The fleece sometimes partakes of the colour of the soil—that is, to a certain extent—on which the sheep is reared; which is effected by particles of the soil mixing with the fleece and gradually staining it of their own colour. All attempts to give colour, according to fancy, by the use of ochre or other matter is highly absurd.

IV. DIFFERENT VARIETIES OR BREEDS OF SHEEP.

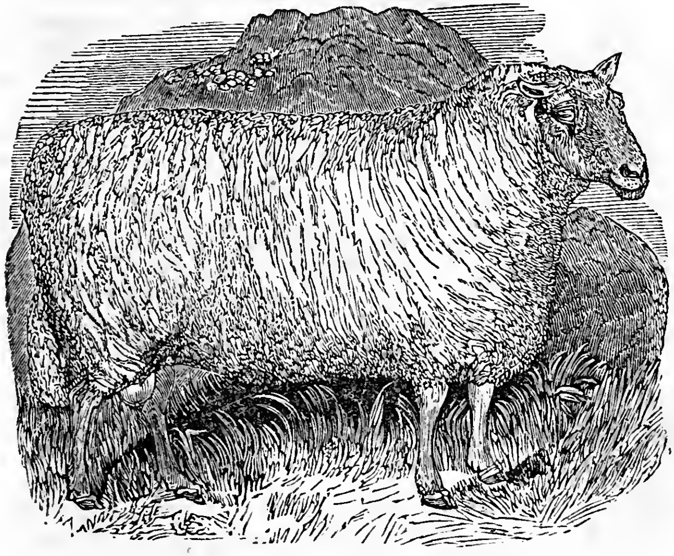
THE United States, from its great diversity of soil, surface, and climate, possesses advantages for the successful prosecution of sheep husbandry, unsurpassed, if equalled, by any other country. Many sections of the country are undulating—the hills mostly covered with fine herbage—enclosures extensive and unequalled—almost every pasture furnished with running water, and sheltered more or less by trees from the summer sun, with other very great and important advantages, render the United States, and even some portions of Canada, highly favourable to the most prosperous culture of sheep. The wool produced in this country—that is, the best, and which has the management throughout of competent persons, possesses every good quality, especially of fineness of texture, goodness of staple, and softness. Some attention was devoted to sheep husbandry and the improvement of wool in this country for a few years preceding the revolutionary war; at that time the finest wool was obtained in New Jersey, which, according to an account laid before Parliament, contained one hundred and forty-three thousand nine hundred and thirty-nine sheep; a much larger number than was found in either of the other colonies. The same report which states the number of sheep, adds that specimens of wool from all the Provinces of North America having been submitted to the wool staplers and connoisseurs of the article, there was but one opinion, namely, that the texture or fineness of the wool from New Jersey, was not only superior to that from the other provinces, but much superior, in almost every point of excellence, to that raised in Great Britain. The specimen from Long Island, New York, ranked next to the Jersey. The reader will, however, bear in mind, that since the period here referred to, very great and astonishing improvements were made in this branch of husbandry in Great Britain, while in this country the reverse was the case, and little or no attention was paid to the improvement of the various breeds until within a few years past. The reasons for this, and the effects produced, are too well known to require further notice.

There are a great variety of breeds of sheep, all probably derived from one parent stock; each possessing some peculiar quality by which it is distinguished from all others: to describe them all, with any show of justice, would require a volume of no small dimensions. In Great Britain, where the greatest improvements have been realized in the culture of this animal, they are divided into two classes, by most authors, the *long-wooled* and the *short-wooled.* Mr. Low, and others equally eminent, divide them into two classes also, namely, the sheep of the mountains, lower moors, and downs, and the sheep of the plains. The sheep of the first class have sometimes horns, and sometimes want horns. The finest of them, the South-down and Cheviot, have no horns. One of them, the black-faced breed, have coarse wool; the Dartmoor and Exmoor have long but not coarse wool; and all the others have short wool. We can only refer to the principal breeds.

The pure breed of the Shetland and Orkney sheep, which exist in the islands from which they derive their name, is of the variety of short-tailed sheep which exist in Norway, and other parts of the north of Europe. They are a hardy race, adapted to the exposed country in which they are reared; but no purpose of useful economy would be promoted by extending them. Their coat is a fine soft wool, mixed with hair.

The *Welsh breeds* form several groups, of small size and peculiar form, their hinder extremities being long, by which they are fitted for vaulting as well as running—wool short, soft, much mixed with hair, and underneath the chin the hair is usually so abundant as to form a kind of beard. There are considerable degrees of difference in the several groups, arising probably from difference of situation.

The *black-faced sheep* are a mountain breed, small of size, but hardy, bold, and active; they are a horned variety, with black faces and legs—wool shaggy and coarse, weighing from three to five pounds the fleece. They feed kindly in good pastures, and their mutton is held in great esteem. It is well suited for a rugged country—but they loose their peculiar traits when naturalized in the plains.



THE CHEVIOT RAM.

The next in order of the mountain breeds is the *Cheviot*, so termed from its being reared in the mountains round Cheviot, whence it has been very widely extended to other elevated districts. These sheep are heavier than the black-faced, without horns, fine wool, hardy, active, and well suited to an elevated country. This breed presents somewhat different characters, according to the nature of the country where it is reared, and the views of breeders. They possess very great fattening properties, and can endure much hardship both from starvation and cold—and in this respect, they are perhaps equal, if not superior, to any other breed.

The Lammermuir farmer, an ardent admirer of them, says, that they are hornless; the face and legs generally white; the eye lively and prominent; the countenance open and pleasing; the ear large, and with a long space from the ear to the eye; the body long, and hence they are called "long sheep," in distinction from the black-faced breed. They are full behind the shoulder, they have a long straight back, they are round in the rib, and well proportioned in their quarters; the legs are clean and small-boned, and the pelt is thin, but thickly covered with fine short wool. The wool extends over the whole of the body, and forward behind the ear, but leaves the face uncovered—a circumstance that gives a very pleasing appearance to the face and head. The muscle and the wool fall well down towards the knee; and although on the thigh the wool is somewhat coarse, the farmer is compensated by the abundant growth of it on that part.

The properties to be desired in a mountain breed are, that it shall be hardy, of good form, of sufficient size, and with good wool. For a combination of these qualities, the mountain breed of the Cheviots has certainly not been surpassed.

The *South-down*, which has been reared for centuries on the chalky soils of Sussex, have obtained a high reputation in Europe, and also in America. Their general diffusion has effected a great and important change on the short-wooled breeds. The specific characters of this breed are—faces and legs gray—bones fine—head clean—neck long and small—low before—shoulder wide—light in the fore-quarter—sides and chest deep—loin broad—back-bone rather too high—thigh full and twist good—wool fine, short, and of good quality, and ranging from three and a half to four pounds per fleece at two years old. Their flesh is of excellent flavour—they are kindly feeders, and well adapted to an extensive range of the lighter soils. They are without horns.

The *Ryeland* forming the early breed of Herefordshire, is early mentioned among the fine wooled sheep of Britain. They have been so merged in various crosses, that remnants of the pure Ryelands only remain. They are destitute of horns, of small size, wool two pounds to the fleece, exceedingly fine. They are excellent feeders and afford superior mutton.

The *Norfolk breed*, indigenous in the counties of Norfolk, Suffolk, and Cambridge, are a powerful race of animals, with horns and long muscular limbs—of a wild, roving disposition, and not easily confined except in high and strong enclosures. Legs and faces entirely black—wool short and fitted for the making of cloths. They have pretty generally given place to the South-down.

The *Wiltshire breed* is now almost extinct as a separate variety; the favourite South-down almost entirely usurping its place. They were the largest of the fine wooled sheep, but of coarse form. Heads large, limbs thick, and the rams strong horns. Their fleeces weighed about two and a half pounds; but their bellies were almost destitute of wool. Slow feeders, yet producing good mutton.

The *Dorset breed*, so named from their native country, have small horns and white faces. Wool good, of middling fineness, weighing from three to four pounds the fleece and upwards. A class of mountain sheep to be mentioned consists of two remarkable groups, the Dartmoor and Exmoor, which derive their names from the districts they inhabit. These wild little sheep are reared in their native pastures of heath, and fattened in the lower country; but they are gradually disappearing.

The races of sheep just referred to may be said to be peculiar to the mountains, lower moors, and chalky downs. The sheep of the lower country or plains, are usually of a larger size, and more productive of flesh and wool, and they are all destitute of horns. The breeds of this class to be here referred to are the old Lincoln, the Romney-marsh, the Devonshire Notts, the new Leicester, and the Cotswold.

The old Lincoln was the most remarkable of all the European breeds for bearing an enormous fleece of long wool. But few of the ancient heavy stock remain, nearly all having been crossed by the lighter sheep of modern times. These crosses are still weighty, and afford large supplies to the London and other markets, being fed in large numbers on the rich marshes of the Thames and elsewhere. They frequently weigh from fifty to sixty pounds per quarter. The pelt is particularly thick, and the fleece consists of very long combing wool, of a rather coarse quality, but weighing generally from twelve to fourteen pounds on the wethers,* and from eight to ten pounds on the ewes.

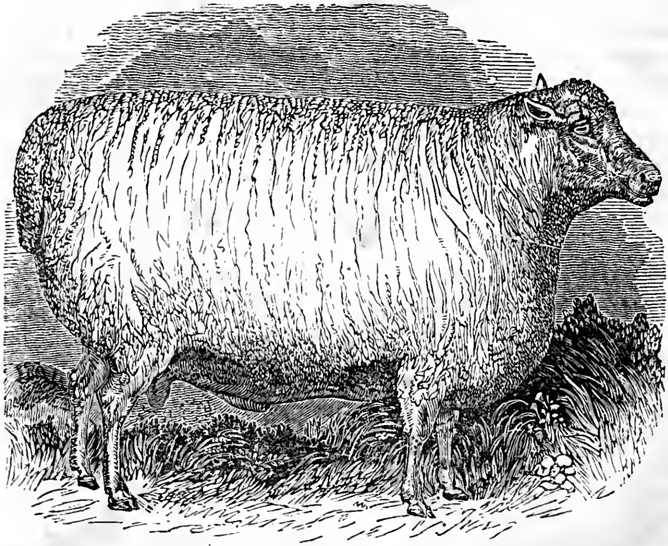
The *Romney-marsh sheep*, is the term applied to a race of heavy sheep, kept from time immemorial on Romney-marsh, an extensive tract of land recovered from the sea in a very early period of English history. The sheep of this rich tract are large, yielding a heavy fleece of long wool. They were highly valued, and until within a few years, have undergone few or no changes. They are not generally esteemed at the present day.

The *Devonshire polled sheep* form two distinct varieties of

* Mr. Clark, of Cauwick, in 1827, exhibited two wether sheep in Lincoln market, the fleeces of which had yielded twenty-four pounds of wool each. They were slaughtered—the carcass of the larger one weighed two hundred and sixty-one pounds—the fore-quarters were each of them seventy-three pounds, and the hind quarters fifty-seven and a half. On the top of the rib the solid fat measured nine inches in thickness. The weight of the smaller one was two hundred and fifty pounds.—*British Farmer's Magazine, May*, 1827.

the same breed. 1. The *south Devon* or dim-faced-nott, with brown face and legs—crooked backed—flat-sided—coarsely boned and wooled—carrying a fleece of ten pounds average weight, and averaging twenty-two pounds per quarter of good mutton, at thirty months old. 2. The *Bumpton Nott*, white face and legs, and in other respects nearly resembling the former in appearance; will yield as much mutton at twenty as the other at thirty months, but not equally productive of wool.* They formed a clumsy race of thick skins; but they are nearly extinct in their pure state, having been almost universally crossed by the new Leicesters.

To these breeds might be added others which may be rather said to have once existed, than to be now found. Such were the *old Warwickshire*, the wool of which resembled that of the *new Leicester*—the *old Leicester*, which is merged in the modern breed, and the *old Teeswater*, which in like manner has had its characters entirely modified by the effects of crossing. These last were a very large race of sheep, arriving at great weight, very prolific in lambs, producing wool long and heavy to the fleece. They formerly existed in the greatest purity in the district of the Tees.



The New Leicester.

The *new Leicester*, portrayed above, is frequently termed the *Dishley breed*, from having been produced by Robert

* Complete Grazier, p. 221.

Bakewell, of Dishley. Their forms are handsome—colour white. As a lowland sheep, and destined to live on good pasture, the new Leicester is without a rival—in fact he has improved, if he has not given the principal value to, all the other long-wooled sheep. The head should be hornless, long, small, tapering towards the muzzle, and projecting horizontally forwards. The eyes prominent, but with a quiet expression. The ears thin, rather long, and directed backwards. The neck full and broad at its base where it proceeds from the chest, but gradually tapering towards the head, and being particularly fine at the junction of the head and neck; the neck seeming to project straight from the chest, so that there is, with the slightest possible deviation, one continued horizontal line from the rump to the poll. The breast broad and full; the shoulders also broad and round, and no uneven or angular formation where the shoulders join either the neck or the back, particularly no rising of the withers, or hollow behind the situation of these bones. The arm fleshy through its whole extent, and even down to the knee. The bones of the legs small, standing wide apart, no looseness of skin about them, and comparatively bare of wool. The chest and barrel at once deep and round; the ribs forming a considerable arch from the spine, so as in some cases, and especially when the animal is in good condition, to make the apparent width of the chest even greater than the depth. The barrel ribbed well home, no irregularity of line on the back or the belly, but, on the sides, the carcass very gradually diminishing in width towards the rump. The quarters long and full, and, as with the fore-legs, the muscles extending down to the hock; the thighs also wide and full. The legs of a moderate length, the pelt also moderately thin, but soft and elastic, and covered with a good quantity of white wool, not so long as in some breeds, but considerably finer.

This account combines the main excellences both of Bakewell's own breed, and Culley's variety or improvement of it. It is precisely the form for a sheep provided with plenty of good food and without any great distance to travel or exertion to make in gathering it.

The principal recommendations of this breed are its beauty and its fulness of form, comprising, in the same apparent dimensions, greater weight than any other sheep; an early maturity, and a propensity to fatten equalled by no other breed; a diminution in the proportion of offal, and the return of most money for the quantity of food consumed.

The *Cotswold sheep*, although the inhabitants of low hills, must be classed with the sheep of the plains. They are of massy form, and bear long wool. They are not as perfect in form as the new Leicester, but their hardiness, prolificness and size, give them a place among the superior breeds.

The *indigenous race of France* has astonishingly improved. They consist of several varieties—the *Roussillonne*—the *Berichonne*—the *Ardennaize*--the *Beaucerronne*--the *Normande*, &c. The principal race now cultivated is the Spanish-French merino, of which there are many millions.

There are several varieties of sheep cultivated in the United States. The native breeds are merged almost entirely by crosses with the best foreign improved varieties which have been imported into the country. Dr. E. Holmes, in his report to the Agricultural Society of Kennebec,* enumerates eight different breeds of sheep cultivated in the United States, viz: the native breed, the Otter, the Merino, the Texel, the Dishley or New Leicester, the Caramanian, the South-Down, the Frederick, and several other varieties; but those above mentioned embrace all worthy the notice of the farmer.

The *native breed of sheep*, of the middle and southern states, was derived from very early importations from the mother country into the colony of Virginia.† They were subsequently introduced into all the colonies from England; but the best race, at that period, would now, in all probability, be considered as a very inferior breed. The first record, according to Dr. Holmes, of the introduction of sheep into New England, is the importation by Edward Winslow, in the years 1624 and 1629, of "one hundred and forty head of cattle, some horses, *sheep* and goats into Massachusetts bay. A genuine native American sheep is rarely found in these days, so completely have they been merged in other and better varieties. Indeed we have no recorded description of the peculiar points by which they were distinguished.‡

The *Otter breed*, so called on account of the length of their bodies and the shortness of their legs, is a singular native

* "The Northern Shepherd, being a Report of a Committee of the Kennebec County Agricultural Society of the State of Maine, upon the Diseases and Management of Sheep"—an excellent little work, of 132 pages, suitable for the pocket.

† There is in fact no *native* American sheep in the proper sense of the term. The only animal of the genus *ovis*, indigenous to this continent, with which we are yet acquainted, is the *Argali* or Big Horn of the Rocky Mountains—familiarly known as the sheep of the Rocky Mountains, respecting which the most exaggerated and unreasonable reports have been circulated. This animal bears a strong resemblance to the Asiatic Argali, deemed by some authors and learned naturalists, but erroneously we think, as the parent of all the varieties of the domestic sheep.

‡ We cannot refrain from repeating in this place, a remark previously made, that every farmer ought to select the best of his sheep for breeders—name them, and correctly note their ages, pedigrees, &c. in a book to be kept in the family for that especial purpose.

variety, formerly somewhat numerous in New England, and more especially in Massachusetts. They are a remarkably quiet race; wool of medium fineness and length. Dr. Dwight, in the third volume of his travels, gives a somewhat flattering account of the breed. He says they originated in the town of Mendon. A ewe, belonging to one of the farmers, had twins, with a marked difference in their structure from other sheep; the fore legs were short and inclined inward; barrel thick, round, but apparently clumsy; remarkably gentle, and not disposed to wander or stray away. Being of different sexes, the proprietor was induced to attempt a breed of the same kind, in which he was successful; the progeny having all the peculiar points of the parents even when crossed; and at the time of the Doctor's visit, they had multiplied to many thousands, and have exhibited no material variation. For some reason or other, never yet satisfactorily ascertained, the breed has become almost entirely extinct.

The origin of the Smith Island sheep is not accurately known. Mr. Custis, of Arlington, to whom the island belonged formerly, if it does not at present, says that they are the descendants of some English sheep placed upon it many years since, and improved by the hand of nature. Previous to the late war with Great Britain, the stock on the island consisted of six hundred sheep and two hundred cattle; but the occupation of the island by the naval forces of the enemy, led to the almost entire extinction of both sheep and cattle; since which period they have recruited very slowly; and no special pains has been taken for their improvement. They are perfectly wild.

The *Frederick breed* is a valuable variety, whose good properties largely increased under the judicious management and fostering care of the late R. K. Mead, Esq., of Frederick county, Virginia. They are said to be "a cross of the merino upon the long-wooled Arlington breed, introduced and cultivated at Mount Vernon by the venerated Washington. In the year 1831, Mr. Mead was drawn out in a communication to the public, in order to correct an error of the press, it having been stated that his flock of the Frederick breed had yielded an average of ten and a half pounds the fleece. He informs the public that they were picked sheep, twenty-eight in number, his whole flock amounting to one hundred and thirty. Of the entire flock the average yield was eight pounds and a half, the heaviest fleece weighing sixteen and a half—the weight of the lightest not given. At the last shearing his flock had increased to over one hundred and sixty; but in consequence of the severity of the winter, later lambs, and more of them with the improved fineness of the wool, the average was seven and a half pounds, sold for forty-five cents per pound. We are informed that several gentlemen are in possession of flocks of this breed, among whom are P. MEAD, THOMAS NELSON, and GEORGE BUNVILLE, of Clark county, Virginia.

We presume that the *Texel breed* reared in Maine is from a foreign variety. We learn that they were introduced into Maine by a gentleman of the name of FILLEBROWN, who procured them of Col. JAQUES, of Charlestown, Mass. Here our information respecting them terminates. They were probably in the first instance brought over by some one of our naval officers, many of whom have manifested the most laudable and praiseworthy spirit in introducing into their native country superior animals of pure blood, and of all kinds. The true Texel is a descendant of a native sheep, found many years since on the slave coast in Guinea. Early in the seventeenth century a few of these sheep were introduced into the islands near the Texel, and called the *Mouton Flandrin* or *Texel sheep.* They are, at this day, justly celebrated for their size, beauty of form, and abundant produce of long and fine wool, milk and lambs.*

The *Tunis sheep* were imported into Pennsylvania many years since, from the mountains in the neighbourhood of Tunis, by the late excellent Judge PETERS. They were hornless, and their bones were small. A ewe that was killed fat, weighed one hundred and eighty-two pounds. The fat was laid on the profitable points, and mingled with the flesh, which was marbled in a striking degree. The mutton was acknowledged to be the finest and the best in the market at that time; and the tail, which weighed from six to eight pounds, was, when dressed, according to the opinion of the Judge, a feast for an epicure.† These sheep were well set with wool, their fleeces weighing from five to five and a half pounds, of fair quality. But at that period sheep husbandry was not regarded in a national light, except by a few sagacious and foresighted individuals. A general apathy prevailed throughout our country—little attention was paid to the manufacturing interest; but the war of 1812 opened the eyes of the nation, and had that effect which the embargo should have produced. They are extensively and profitably crossed with the native breeds of Philadelphia, Delaware and Lancaster counties.

A prejudice, as strong as it was unjust, was excited towards the close of the last century against the use of mutton as meat. For some reason, strange as it may appear, still unknown, this

* Sheep Husbandry, p. 121.
† Transactions of the Philosophical Society of Philadelphia.

outrageous prejudice, so inimical to the interests of the nation and the health of individuals, was carefully cherished by many of the intelligent men of the times, and the result was, that it was almost wholly rejected as an article of food. The farmer, therefore, could derive little or nothing from the carcass of the animal; the natural consequence was that sheep husbandry fell into almost total neglect. The illustrious WASHINGTON, having received from various parts of the world, various specimens of farm stock, of pure blood and superior excellence, set himself about correcting this great national evil, as he justly regarded it. He therefore paid especial attention to the culture of sheep, the improvement of the breed, &c., and in a short period the hospitable board of Mount Vernon was renowned for the peculiar excellence of its mutton, rivalling in richness, sweetness and delicacy of flavour the best and most extolled of foreign lands. But, in the midst of his career of usefulness, when his powerful example as an enlightened and successful cultivator of the soil, and an ardent advocate for the improvement of live-stock of all descriptions, was beginning to diffuse itself among the people, who regarded him as the "father of his country," he was removed by the hand of death, and a whole nation left to mourn.

The *Arlington long-wooled sheep*, a favourite breed in Virginia, originally bred by WASHINGTON, and afterwards very essentially improved, in some important and essential points, by Mr. CUSTIS, was descended from a noble full-blooded Persian ram and some ewes of the improved Bakewell flock. They bear a strong resemblance to the improved Leicesters. The staple of their wool is occasionally fourteen inches long, soft, silky, white, well calculated for fine woollen fabrics.

The *Camlet-wooled or Caramanian sheep*, a singular variety, and which at the time excited no little curiosity, was introduced into this country in 1835, by Capt. GERRY, of New York. This animal was taken from on board a Turkish ship, captured by the Greek Admiral TOMBAZO, who very politely presented it together with a female to Capt. GERRY; the female unfortunately died on the passage. From all the information the Captain could obtain, they were from Caramania, a province in Asia Minor. The buck was sent on the arrival of the vessel at New York to the farm of WILLIAM SHOTWELL, Esq., of Woodbridge, New Jersey, "where, we are informed, they have been extensively propagated. They are large, long-legged sheep—necks long—heads horned—backs straight--chest moderately wide--wool very long, coarse, dry, wiry, and very strong; somewhat similar to goat's hair. The wool is said to be particularly adapted to the manufacture of camlets. Their flesh is good. A few of them have been reared in Maine; but it is believed that the wool has not been manufactured into any thing but coarse fabrics."*

The *Saxon sheep* are a variety of the merino, crossed with the best native breeds of Saxony. At the termination of the seven years war, (1765,) Augustus, Elector of Saxony, sought patriotically to advance the interests of his people, by promoting an improved state of agriculture, and the extensive introduction of all kinds of improved farm stock. He introduced from Spain several hundreds of sheep of pure blood. It was found that the climate suited them, and that the native stock was greatly improved by the cross. They have been introduced into the United States from Saxony; and the crossing has lengthened the staples, and increased the fineness of the wool of our breeds, but the quantity has diminished; and it is asserted by WILLIAM JARVIS, a respectable and experienced wool-grower of Weathersfield, Vermont, that the crossing has not only reduced very essentially the quantity of the wool of our flocks, but that it has had a tendency to injure their constitutions.

HENRY D. GROVE, Esq., of Buskirk's Bridge, (Hoosick, Rensellaer county, New York,) who is familiar with these sheep, and understands the proper mode of treatment, has cultivated them here to great advantage. His flock is of the *pure breed* of Saxony, selected and imported by himself, and he maintains that they (the pure Saxony breed) are not only adapted to this country, but will prove in the end the most valuable. They are healthy and hardy. He says, "last year I *raised* one hundred and one lambs from one hundred ewes, only one ewe having twins"—of course none of the lambs died, which speaks well for the breed or treatment, or both. "My flock last year of two hundred ewes and lambs, averaged two pounds six and a half ounces the fleece; the average, if I had had a fair proportion of wethers, would have been three pounds the fleece, as my grown bucks sheared four and a half pounds." Mr. GROVE says the *mutton* of the *true* Saxon is *equal* to that of the best South-down. On account of its peculiar fineness the Saxon wool brings a higher price than any other in the market. The following are the prices of the wool of the different breeds at New York at the periods stated: 1835, May—Saxony 80 cents; full-blooded merino 60; native and quarter 33; 1838, Jan. 21—Saxony 45 to 50 cents; merino, full-blood, 35 *a* 40; 1839, Aug. 28—American Saxony fleece 55 *a* 60; full-blooded merino 50 *a* 55; native and quarter 38 *a* 40. This is an infallible test.

* "Northern Shepherd," p. 24.

The *South-downs*, the *Dishleys* or *new Leicesters*, and the *Merinoes*, are the only breeds extensively cultivated among us at this day; and as they possess every necessary quality of excellence, it would seem unnecessary to extend the variety. The characters of the two first mentioned breeds, are given at pages 366 and 368. The latter breed, or *merino*, which seems now to be most generally diffused or sought after, is here noticed more at length.

The *Merino or Spanish sheep*, the wide diffusion of which in all wool-growing countries has effected a complete revolution in the character of the fleece*—ancient authors inform us that about the beginning of the Christian era, there were breeds of sheep existing in Spain of a variety of colours, white, black, red and tawney, and that the red-wooled sheep were considered superior to the others. Mr. Youatt supposes that these breeds were originally from Italy. Columella, a colonist from Italy, and uncle to the writer of a most excellent work on agriculture, resided at Baetica, in Spain, during the reign of Claudius, (A. D. 41;) he introduced to his farm some fine African rams and a few of the Tarentine sheep—and it is altogether probable that his experiments laid the foundation for a general improvement in the Spanish sheep—an improvement which was not lost, nor even materially impaired, during the darker ages which succeeded.† But Spain, it should be remembered, possessed valuable breeds of sheep previous to the time of Columella; but the great and permanent improvements that took place, were, as before remarked, the unquestionable results of his enlightened views, and judicious and persevering efforts.

The Spanish sheep are divided into the *estantes* or *stationary*, and the *transhumantes*‡ or *migratory*. The first are those that remain in flocks on a farm or district—the last wander some hundred miles twice a year in search of food. The stationary division consists of two breeds. The first is the *Chunah breed*, entirely different from the merino, larger, taller, heavier, with the head smaller and devoid of wool. The wool is of inferior value; yet the breed extends almost throughout the whole of Spain, and is very numerous even where the merinoes abound, and are found in their greatest perfection. In the year 1464, Edward IV., King of England, sent as a present to John, King of Arragon, a score of *Cotswold* ewes and four rams, which, it appears, were crossed with the *Chunahs:* and from this circumstance has originated the absurd story that the present excellence of the merinoes of Spain

* Sheep Husbandry, p. 145. † Ibid, 164.
‡ From *trans* and *humus*, indicative of their change of climate and pasture.

is owing to the early introduction of the English breed into that country.

The other principal breed of stationary sheep consists of the *true merinoes*, which generally remain in the districts in which they are reared. The sheep of this foreign species—a wether of which breed is here delineated—have horns of a middle size, of which the ewes are sometimes destitute. Faces white—legs of the same colour, rather long, but the bones fine—defective in form—slow feeders—the average weight per quarter of a tolerably fat ram being about seventeen pounds—the ewes in the neighbourhood of eleven pounds; and the mutton is not by most persons as highly esteemed as that of our other favourite breeds, whose peculiar excellence consists in being kind feeders.* With many first rate breeders, symmetry of proportion constitutes a principal criterion of excellence—with these the merino breed is not in high repute; although it has been most conclusively shewn by Lord Somerville and Mr. Livingston, that symmetrical proportions are not essential to the production of fine wool. The merino itself is a living witness of the fact.

The excellence of the merino consists in the unexampled fineness and the peculiar felting property of their wool; and in the weight of it yielded by each individual, averaging from three to five pounds, and in Spain eight pounds from the ram and five from the ewe. From the closeness of their coat, and the luxuriance of the yolk, they do not suffer much, if any, more than other breeds from the extremes of cold and wet. They are a patient, gentle, quiet animal, and will amply recompense the hand of careful culture, whether it be extended to them under a burning tropical sun or in the frozen regions of the north.

The Spanish merino breed was introduced into England in 1788, and crosses with the Ryeland, South-down, and other choice fine-wooled breeds soon ensued. George III. imported full-blooded merino rams from Spain, and cultivated them with great care; and in the year 1804 the sales of his improved flocks attracted great attention to the breed. The result of the crosses with the native breeds, did not fulfil the expectations formed; the experiments being too casually pursued, and too hastily abandoned to be decisive.

* Flocks, however, of the pure merinoes, have been occasionally preserved, and the progeny of these has remained superior to the new or cross breeds. The naturalized merinoes retain their natural characters, though the wool becomes longer and heavier than in Spain, and the body larger. But the entire form of the merino as a feeding animal, is bad—he is too small, and the return in mutton deficient both in quantity and value.

The pure Spanish merinoes were first introduced into the United States by the indefatigable exertions of Chancellor LIVINGSTON and others of New York, and Col. HUMPHREY of Connecticut, in the year 1802.* The importations were not, however, confined to these public spirited individuals; some others, in other parts of the country, with a laudable zeal to improve the quality and value of their flocks, followed their example. The importance of sheep husbandry was slowly but surely diffusing itself throughout the nation, when the eyes of the people were suddenly opened by the war of 1812, which effectually checked all commerce between the inhabitants of the two belligerent powers, namely, the United States and Great Britain; and the want of cloths, cassimeres, &c. which had been supplied by England, was very seriously felt. The value of the sheep—for that which he should be valued—his fleece, was not only justly appreciated, but in the case of the merino, yielding a finer wool than others, we passed from a state of apathy to the other extreme—a complete mania seized upon the people—the most extravagant and incredible prices were paid for a single full-blooded ram,†—thousands entered into the speculation; merino wool advanced rapidly to two dollars and a quarter per pound, but suddenly fell on the restoration of commerce which immediately succeeded the declaration of peace. Thousands were ruined—the wool-growers turned their attention to other matters, and although for the time many flocks were shamefully neglected, yet the reputation of the breed on the whole was permanently established.

Improvement of breeds.—The breed of sheep to be reared in any case must be selected according to the nature of the pastures, and the artificial means possessed of supplying food. If a mountain breed is selected for rearing on a low arable farm, then the advantage is lost which the farm possesses of producing a larger and finer class of animals. If, on the other hand, a lowland breed is carried to a mountain farm, an error of a different kind, but yet more hurtful,

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* It is stated in the Archives of Useful Knowledge, Phila., 1810, that E. J. DUPONT, Esq., of Wilmington, Del., was the owner of the first *full* blooded merino ram introduced into America, called Don Pedro, and imported in the year 1801. The importation consisted of four fine young ram lambs, selected by M. DELESSERT, who had been at the head of a commission appointed by the French government to select four thousand merino sheep, which by treaty the Spanish government had agreed to present to France. Unfortunately, three of the sheep died on the passage. The ship arrived at Philadelphia on the 16th of July, 1801, in which year he tupped nine ewes near New York. He was then moved to Rosendale farm, near Kingston, on the North River, where, during the years 1802, 3 and 4, he served a large flock; his progeny was numerous, and with their sire sold at auction in 1805, at very low prices; Pedro himself being purchased by Mr. DUPONT for sixty dollars, and was removed to Wilmington, where he continued to serve from fifty to sixty ewes per annum, to the benefit of the state.

† Such was the intense interest excited, that sales were readily effected, varying from six to nine hundred dollars per head; and in a few instances, from fifteen hundred to two thousand dollars were paid for a single ram!

is committed; for a fine stock will be ruined if placed in circumstances where it cannot be maintained.

The breed, then, being selected which is the best suited to the circumstances in which it is to be placed, the province of the breeder is to breed from the best individuals.

Disposition to fatten, and early maturity, are the properties most regarded in sheep to be reared for food. But the property of yielding good and abundant wool is not to be disregarded; and there is another property essential in the rearing of this class of animals, namely, hardiness and sound health of individuals.

In the case of the sheep as of the ox, refinement in breeding may be carried too far, and with more danger. By breeding from animals near of blood, the same means exist in the case of the sheep as of the ox, of giving that prematurity of age which produces fineness of the bones, and a disposition to fatten. But it is attended, too, with the same effect, of rendering the animals more delicate, and subject to diseases. It seems a violence done to nature, when carried too far, and the animals show the effects of it by becoming too fine in their skins, by ceasing to produce wool in sufficient quantity, by the females ceasing to yield milk, and by the males becoming at length unable to continue their species.

Whenever, then, the sheep of any flock become too near of blood, the breeder should resort to the best animals of another family, but of the same breed, to continue his stock. This species of crossing is now easy, since there is scarce any of the cultivated breeds of which superior males may not be procured from other flocks. In the case of the New Leicester, so widely diffused and highly improved, no necessity can exist for breeding from animals too nearly allied.

Form.—In the sheep, as in other animals, certain external characters indicate a disposition to fatten, and at an early age. Other characters indicate a disposition to produce wool, and the quantity of wool, it has been said, is not to be disregarded in the rearing of the sheep. But where the main purpose in rearing the sheep is for food, the province of the breeder is to accomplish this object with as little sacrifice as possible of the secondary qualities.

A property that indicates a tendency to fatten in the sheep as in the ox, is a general rotundity of form and fineness of the bones. The chest should be broad, the ribs well arched, and the back and loins accordingly broad, flat, and straight. The sheep, like the ox, occupies, independently of the neck and head, nearly a rectangle, and the larger the proportion of this rectangle which the body occupies, the more perfect is his form as a feeding animal. His body, therefore, should be large in proportion to his limbs, or, in other words, his limbs should be short in proportion to his body; his breast should be well forward, and his belly straight; his head should be small and his ears thin; his limbs to the joint should be fleshy, below delicate and covered with short hair: his skin should be soft and elastic; his wool soft to the touch, thick, and coming well forward to the face, but not covering it: his face and forehead should be covered thickly with short hair, and his eyes, as indicative of health, should be lively.

Rearing and feeding.—In the rearing and feeding of sheep, the system to be adopted must depend upon the nature of the farm, and the kind of stock. The treatment of mountain-sheep in an elevated country is, of necessity, very different from that of the larger sheep on an arable farm. It is the rearing and feeding of the latter which may be first considered.

The female sheep are ready to receive the ram in November, or sooner; but the precise period is determined by the forward condition and constitution of the animals. A medium period is from the 5th to the 10th of November, in which case the ewes will begin to lamb previous to the beginning of April, and the principal period of lambing be in the early part of that month.

To prepare the ewes, they should receive good feeding for a time previous to the male being introduced; and, for this purpose, they may be turned upon the stubbles where the young grass is for a fortnight before. The ram is put into the field where the ewes are pasturing, and herds along with them. He covers them as they come into season; and 1 ram is considered sufficient for 80 sheep. In order to show what females have received him, and what have not, it is usual to smear his breast with pigment, which appears upon the fleeces of such ewes as he has covered; and if more than one ram is with the flock, then, by smearing the rams with different coloured pigment, as red and blue, the progeny of each is known. Such ewes as have not received the ram may be taken from amongst the breeding stock and fed for the butcher.

Rams are fit to propagate their species in the autumn of the second year. Well fed females will receive the male even in their first year; but the proper period is in the October of the second year.

The food of sheep is herbage, upon which they feed during summer. In winter, when the pastures fail, the feeding-stock are fed on a full allowance of roots, or other succulent food; but the ewes are suffered to pasture during the entire winter, and merely receive such an allowance of other food as is required to keep them in condition. During hard frosts and snow, they may receive hay, which may be either given to them from racks, or simply spread upon the ground. They thus pasture in the fields, receiving hay when occasion requires, until within a few weeks of the period of lambing, when they should receive an allowance of turnips, or other succulent food, laid down in the fields where they are pasturing.

When the period of lambing arrives, every vigilance is necessary on the part of the shepherd. He must be at all times at hand to assist the births. He must take his necessary rest only during the day, and for the shortest time possible, when his place can be supplied.

The birth of the young must be assisted, but not precipitately. The proper position of the fœtus is with its head couched between its fore-legs. In other positions the birth is difficult, and it generally becomes necessary to turn the fœtus, which is done by elevating the ewe from behind. Experienced shepherds are acquainted with these duties.

When the young is born, it is to be immediately recognised, and licked by the dam, and assisted to the teat when necessary. When the lamb of any ewe dies, another should be supplied to her; either one of the twins of another ewe, or one that has lost its own dam. Sometimes much difficulty is experienced in getting the ewe to adopt another lamb; and cases even occur, when the ewe, from some unknown cause, deserts her own young. In proportion as the ewes have lambed, they should, if possible, be transferred with their young to a field of new grass.

An operation to be performed upon the lambs is castrating the males which are not to be reserved for rams. This may be performed in a few days after the birth, generally in 8 or 10 days. It is done by the shepherd, with an assistant to hold the animal, and, at the same time, it is usual to cut off a portion of the tail. The operation is performed on lots of the lambs, and not on each singly as it reaches a certain age. It is well that it be performed early, the difficulty and danger increasing with the age of the animal, and that the weather at the time be dry, and, if possible, cloudy and mild.

The lambs continue with the ewes sucking them till the period of weaning, which generally takes place by the middle of July. Weaning is simply performed by removing the young from their dams, and keeping them for a time so far asunder that they may not be disturbed by their mutual bleatings.

When the lambs are weaned, the ewes should be milked for the purpose of relieving their udders and running them dry by degrees. Three milkings will generally suffice, though, should any particular cases require more, it is the province of the shepherd to attend to them. Supposing the lambs to be weaned in the evening, the first milking may take place in the following evening, or in 24 hours; the next at an interval of 36 hours; the last at an interval of 48 hours. When the ewes are to be milked, they are driven into a narrow pen, the milkers, with pails, milking the ewes from behind; and on each ewe being milked, she is turned round in the pen by an assistant, the milkers continuing their work until the whole are milked.

After being weaned, the lambs receive the name of hoggets, or hogs, the rams being termed tup-hogs, the castrated males, wether-hogs, the ewes, ewe-hogs. The wether and ewe hoggets are now pastured together for the remainder of the season. When winter approaches, or rather when the pasture fails, the hoggets, male and female, are to be put on a full allowance of roots.

When the sheep are penned upon the turnips, they are confined to a given space, generally sufficient for them to consume in one week. The temporary fences used for penning them consist either of wooden hurdles, or nets, the latter being the most economical and convenient. In this space the sheep consume the turnips, and when they have eaten them close to the ground, the remaining portions of the bulbs are picked up by means of the hoe, so that the sheep may be enabled to eat them wholly up.

When they have consumed one space, the pens are shifted to another, in such a manner as to leave the ground already cleared open to the animals for walking over and resting upon. A rack should be placed in the field with hay.

Sometimes when young sheep are penned till late in spring, they find difficulty, from their teeth becoming loosened, in eating the turnips. In this case, the turnip-slicer may be employed, and then the sheep may be brought from the turnip-field, and have the turnips laid down to them in a field of dry sward.

The young sheep or hoggets are in this manner fed on turnips till the grass is ready in spring. This will be early in April, or in the southern parts of the country, in March; for sheep do not require the same full herbage as cattle, and may therefore be turned out at an earlier period to the fields.

Should the roots fail before the pastures are ready, then the young sheep are to be carried on by substitutes, as hay, or even corn. It is rarely, however, necessary on a well-ordered farm to resort to this costly species of feeding; yet, when necessary, it must be done, since this inconvenience is less than the evil of suffering the stock to lose condition.

The period of shearing sheep depends upon the forward condition of the animals. When fat, the old wool begins to come off more early than when they are less forward. Good conditioned sheep may be shorn in May, but always early in June; the precise period being denoted by the state of the wool, which comes readily off when plucked, and which would fall entirely off were it not shorn.

About eight days previous to shearing, the sheep are driven to a pool, if possible in a running stream, and three or more persons are to stand in this pool. The sheep are brought forward to a pen on the bank, and lifted into the pool one by one. The first of the persons in the pool seizes the sheep by the wool, and keeping it on its back, plunges it well from side to side. He passes it on to the person next in order, and he in like manner plunges the animal in every direction. This person then passes it on to the third, who examines the fleece as well as circumstances will allow, plunging the sheep at the same time, and thus finishing the operation. The animal is thus passed through the hands of three persons, and sometimes more; but the last should be a trusty person, such as the shepherd himself, whose duty it is to see that the fleece is completely washed and freed of sand and impurities.

This description has a reference to young sheep, whose management we are now considering; but the same method is applicable to all the sheep upon the farm, young and old, with this difference, that the ewes, which are at this period suckling their young, have the lambs separated from them during the process of washing.

The sheep being washed, are driven to a clean pasture, and when the fleece is dry, which it will be in a few days, if the weather is good, the sheep may be shorn; but it is better that seven or eight days should elapse before shearing them, in which case the yolk of the wool is renewed.

When the sheep are to be shorn, they are driven to a pen or other enclosed space, and brought one by one to the shearers. The sheep to be shorn is first placed upon his rump, and the shearer, with the shears, beginning at the neck, clips in a circular direction down the belly towards the back. The animal is then laid on his side, and kept down by the leg of the shearer, who clips the fleece all round to the back. Turning the animal on the other side, he clips in like manner round to the back; then raising the sheep, he clips the part of the fleece not yet cut away, and so lets the animal go, taking care that it shall not entangle itself with the fleece. The fleece, as soon as it is shorn, is taken away by an attendant, spread out, neatly rolled up with the inner surface outmost, and then deposited in some dry place, until it is packed in the wool sheets.

When the animals are shorn, they are frequently marked with a stamp dipped in boiling tar, to distinguish the kinds and ages of the sheep. This kind of mark, though convenient, is injurious to the wool.

After the operation of clipping, the young sheep are termed shearling sheep; the castrated males, shearling wethers; the females, shearling ewes; the rams, shearling tups or rams. But it is common to apply to them at this period the following terms:—The shearling wethers are termed dinmonts; the females are termed gimmers; and the rams are still termed shearling rams; and these names the animals retain until they are shorn of their second fleece in the following year.

The shearling ewes or gimmers are, after being shorn, kept at grass for the remainder of the season, and they receive the rams in October in the manner described.

The shearling wethers or dinmonts are soon after shearing fit for the butcher. They are then about one year and three months old. If of the Leicester breed, they will weigh 16 or 18 lbs. the quarter, and their fleeces will weigh 7 lbs. each, or more.

But should the pasture be inferior, the breed bad, or the stock not in sufficient order, or should the state of the markets render it inexpedient to sell, then the dinmonts may be kept upon the farm for one winter more. In this case they are pastured precisely as when they were hoggets during the remainder of the season; and when in autumn the pastures again fail, they are penned on turnips, and treated in the same manner as in the previous winter.

The dinmonts are frequently sold fat before they have completed the entire winter's feeding. But it is more common to keep them during the winter on turnips, to put them upon good and early grass in the spring, and to dispose of them after they are shorn. They are then two years and two or three months old, and have yielded two fleeces to the breeder. They will weigh at this age from 25 to 30 lbs. the quarter, or more, and their fleeces will weigh about 8 lbs.

These and other sheep, after they are shorn of their second fleece, are termed two-shear sheep: the males not castrated are simply tups or rams; the males castrated are wethers, and the females are ewes. It is more profitable to be able to feed off sheep when shearlings than to retain them till they are two years old. The former is the perfection of feeding; but it is a perfection attainable on every arable farm in this country on which roots can be raised, and a superior breed of sheep maintained.

In the practice of the farm, then, the male sheep are disposed of either after having yielded one fleece, or after having yielded two fleeces. Such of the ewes as are reared on the farm, but are not to be employed for breeding, may be treated in the same manner.

But with respect to the ewes upon the farm kept for breeding, it is necessary, after they have borne lambs for several years, to dispose of them, and to supply their place by younger ewes reared upon the farm. A certain number of gimmers being each year added to the breeding stock, an equal number of the oldest ewes are disposed of, and thus the number of breeding sheep is maintained.

And not only are all ewes which have borne the required number of lambs to be disposed of in this manner, but all breeding sheep, of whatever age, that are not healthy, or that are of a defective form, and their place is to be supplied by the younger and better stock reared upon the ground.

These, then, have been the principal points of practice in the management of a sheep-stock reared upon the farm: The female stock, like the males, were suckled by the dams till July; they were then weaned, and pastured with the wether-hogs during the remainder of the season, when they were put together with the wether-hogs on turnips before winter; they were fed on turnips till April, when they were turned out to pasture along with the wether-hogs; early in June they were clipt; in the month of October they were joined to the rest of the ewe stock, supplying the place of the older ewes that have been disposed of; and after this time they are treated in all respects as breeding ewes, and kept upon the farm till they have borne lambs for three or four years. The males, it has been seen, were castrated a few days after birth,—were weaned in July, when they received the name of wether-hogs,—were pastured during the remainder of the season, and were then, together with the ewe-hogs, penned on turnips; in the following April they were put on grass, and by the beginning of June they were washed and clipt; they then received the name of dinmonts, when they were fat, and ready to be sold as soon afterwards as convenient: or when, from the deficiency of feeding or other cause, they were not then ready for the butcher, they were again pastured during the summer, a second time penned on turnips, and generally pastured till they were clipt the second time, when they were wethers and in high perfection with regard to growth and feeding.

Sheep, especially when fat and loaded with wool, are often unable to rise when they have fallen upon their backs in any hollow place, and they will perish if not relieved in time. To guard against these and all other accidents, sheep must be regularly tended. They must be examined at least twice in the day; they are to be cleaned when necessary, by cutting off clotted wool, and above all things they are to be guarded against the attacks of maggots. In the latter case, a decoction of tobacco mixed with spirits of tar, and in some cases a solution of sublimate of mercury, are the remedies commonly employed. Their heads are frequently injured by the attacks of flies: for which a little tar spread upon the wound is the most frequent and the best remedy.

In the whole treatment of sheep, gentleness is of great moment. The worrying and harassing of them by dogs is never to be thought of. In upland pastures the faithful dog is essential to the shepherd; in an enclosed country the necessity for employing him is greatly lessened, and he is always to be used with temperance and humanity towards the flock.

The treatment of a lowland stock has been described, where the breeder is likewise the feeder; but sometimes the object of the breeder is not to feed the stock which he rears, but, after having brought it to a certain age, to dispose of it to others who will feed it.

Sometimes, on the other hand, the design of the farmer is not to breed sheep, but to buy them from others whose interest it has been to rear and not to feed them. The effecting of these sales, on the one hand, and the making of these purchases on the other, constitute one of the branches of farming as a business. But it is a branch which cannot be taught by rule, but must be learned by practice.

One of the branches of sheep-farming, in which the breeder is likewise the feeder, is the rearing of lambs and selling them when fattened. The lambs are fattened by the milk of the mothers, and are merely disposed of when they are ready for being killed. The feeding of the lambs in the house for early consumption is also practised, and in some parts has been brought to a system. This branch of management need not be described. The sheep of the Dorset breed are valued as being the best suited to yield early lambs in this manner.

Grass in summer and roots in winter, with a little hay for the ewes, have been spoken of as the food of sheep. The basis of this system is the turnip crop. But, in certain cases, this mean of support may fail or be wanting, and it then becomes necessary to resort to other substances. Potatoes, mangel-wurtzel, and other roots, may be eaten by sheep as well as by oxen; and cabbages and rape are perfectly suited to the purpose of feeding them.

All kinds of farinaceous food are consumed by sheep. When grain is given, it is the common practice to lay down the sheaves unthrashed, when the sheep readily separate the grains from the straw. Brewers' grains may be given to sheep; and they will consume this nourishing substance readily. Oil-cake, too, is well calculated to fatten sheep, and may be used occasionally where cheaper methods of carrying on the stock are wanting.

Besides common food, there is a condiment, *salt*, of great importance to sheep, as to all domestic animals, but which is too much neglected in the rural economy of this country. If laid on flat stones or in troughs, the animals will quickly find their way to it, and will be seen to wait for their daily portion of salt with as much eagerness as for their periodical supplies of food.

I have spoken of the management of a lowland breed of sheep. It is necessary to consider also the treatment of the animal under circumstances entirely different; that is, when reared and pastured in a country where cultivated food is either wanting or to be procured in limited quantity.

The Cheviot sheep are reared in an elevated country. But in the places where they are produced, turnips and the cultivated grasses may generally be supplied in certain quantity.

In the rearing of this breed, the rams are usually put to the ewes from the middle to the 20th of November, so that the lambs shall begin to drop about the 1st of April. The ewes generally receive no further feeding during the period of gestation than hay in falls of snow. This may be supplied to them from racks, or simply laid upon the surface of the snow. The ground is frequently covered with snow for six weeks; but it is sometimes covered for twice that period. During the winter, therefore, a store of hay should be in reserve for three months' consumption, and this may be calculated at the rate of 1½ lbs. for the ewes and older sheep, and 1 lb. per day for the younger sheep. Should the winter be mild, what is left remains till the following season.

Where turnips are raised, these are given also to the breeding stock. The ewe receives them during falls of snow, and in an especial degree when the lambing season arrives and during its continuance.

When both hay and turnips are to be supplied, it will be proper either to give them at the same time, that is, a portion of hay and a portion of turnips each day, or to begin with hay and end with turnips; for to begin with turnips and end with hay is to cause the sheep to pass from succulent food to one which is less grateful, so that a time elapses before the animals are reconciled to the change. But when turnips are given, and hay supplied at the same time, the sheep take to this variety of feeding very readily.

The process of lambing in these high districts demands the utmost vigilance of the shepherds. They must never be absent night nor day, but relieve one another, and inspect the flock at short intervals, so as to assist the parturition of the ewes when necessary.

Sometimes the lambs at their birth are so weak that they cannot rise to the teat, and thus perish or are forsaken by the dams. The shepherd assists them in such cases, and frequently takes the ewe with her young to a house or place of shelter, where they can be attended to. When the ewes have twins, and thus have two lambs to nurse, it is usual to give them a more liberal supply of food. For this purpose it is convenient to have an enclosure of early grass near the place of lambing or the shepherd's cottage, to which ewes with twins, such as have too little milk, and such as are sick or infirm, or from any cause require more attendance than the rest of the flock, may be taken. Though various ewes produce twins, it is regarded as a favourable circumstance in the case of this class of sheep when one lamb can be reared for each ewe of the flock. It is well when 19 lambs can be reared for every 20 ewes.

As soon as the weather is favourable, after a considerable number of the ewes have lambs, they are collected into a fold, and all the males castrated, except such as are reserved for rams: and the sooner the operation is performed after the lambs are a few days old the better.

When the period of shearing arrives, which is known by the wool being fully grown, the sheep are washed, sometimes by men standing in the pool, who wash each sheep separately, in the manner before described; or, when the flocks are large, by causing them to swim two or three times through the water to the opposite bank. After being washed, they are kept as much as possible on ground where they are preserved from rubbing on banks, or otherwise soiling their wool. In two days, if there be no rain, they may be shorn, but it is better to wait seven or eight days. The wool is shorn in the manner before described, and stored in a proper place till packed in sheets. As soon as each sheep is shorn it may be marked with a stamp dipt in boiling tar. The mark is made on different parts of the body, as near the shoulder, the far shoulder, the near rib, the far rib, so as that the different kinds and ages of the heep can be known at a glance.

About the middle of July the lambs are weaned, when such lambs as are to be disposed of are separated from the remainder and sold. The lambs, now hoggets, are put on such good pasturage as the farm affords, and supplied, if possible, with turnips throughout the winter, at the rate of a cart-load for 7 or 8 scores in the day.

Some farmers still milk their ewes for a few weeks; but the more approved practice is to milk them only for a few days, merely to relieve the ewes of their milk by degrees.

Before winter, it is a general practice, the utility of which is experienced in a very elevated country, to smear the skins of the sheep with a mixture of tar and butter. The practice indeed is found to deteriorate the wool, by staining it, and rendering it unfit for receiving the brighter colours in dyeing. It is found, however, conducive to the health of the stock in an inclement country, destroying vermin, of itself an important object to the health of sheep, and acting to a considerable degree in defending the animals from cold and moisture.

It is a general error on merely stock farms to plough up too much of the land for crop, or to intersperse the cultivated land with the range of the sheep pasture. The object of tillage on such farms is to raise turnips and clover-hay, for keeping the stock throughout the winter months, and, this being attained, the farmer ought rarely to carry his system of tillage further.

In many cases, indeed, the farmer of a mountain farm has also a sufficient quantity of lowland ground to combine the practice, both of rearing sheep and feeding them. This, when it occurs, is beneficial; but when it does not occur, the proper occupation of a mountain farm is to rear sheep, and not to feed them; and the general principle of management is to sell the sheep which are reared to the feeder as soon as they have come to tolerable maturity, that is, either after the first winter, when hoggets, or after the second winter, when dinmonts.

Reared in yet more elevated districts than the Cheviot, are the Black-faced heath sheep. These are the hardiest of all our races of sheep, and in the parts of the country where they are principally cultivated, they must depend chiefly or entirely on the natural herbage of the farm.

The rams are generally put to the ewes after the middle of November, and one ram is assigned to sixty ewes or less. The lambs intended for wethers are castrated somewhat later than the other sheep: they are weaned late in July, and the ewes milked sometimes for a few weeks. The sheep are shorn from the end of June till the middle of July; and when they are to be washed, they are driven to a pool or deep stream, and forced to leap from the bank. This being a very wild race of sheep, the same delicacy of management is not necessary or practicable as in the case of the more docile breeds of the plains. They are shorn in the same manner as the other sheep; and opportunity is then taken to place upon them their distinguishing marks. In all cases they should be smeared; for though, as in the case of the Cheviot sheep, the wool is injured by the process, this is more than compensated by the benefits resulting to the flock.

The food of these hardy sheep is in summer and winter the same; and all that can be generally done is to supply them with some coarse hay during long-continued falls of snow. They are sold at the ages which suit the nature of the farm and the convenience of the breeder.

The management of the other kinds of down or moorland sheep need not be detailed. These breeds are generally in low situations, where the difficulty of procuring food is comparatively little. The nearer the management of this class of sheep approaches to that of the larger sheep of the plains, already described, the more perfect will it be.

Diseases of sheep.—The diseases of these valuable creatures are sometimes of a very formidable nature, and baffle all the means of remedy which are known to us. Of these diseases the most dreaded is *rot*, which often extends over whole districts of a country.

It is known that this disease is favoured or produced by a humid state of the soil and atmosphere. It is in wet seasons that it prevails the most, and is the most fatal. By draining land the tendency to it is lessened or taken away. Often sheep are rotted by pasturing on the wet parts of the farm, whereas if kept from these parts they remain free from disease. Nay, a single sheep that has a disposition to pick up its food in moist places will die, while the others will not be affected.

The animal affected does not all at once show symptoms of disease; for sometimes it remains a considerable time in apparent health, and long after it has been removed from the place of infection, droops and dies. Sheep are every year purchased in seeming health, and yet after a time they are found to be affected. A moist and even luxuriant autumn is dreaded above all things by the owner of sheep; for the seeds of infection are then often spread to appear in the following spring, or after the lapse of a longer period.

The signs of rottenness in sheep are familiar to all shepherds. The animal becomes emaciated, its eye becomes dull and glassy, a black purging generally takes place, the wool, on being pulled, comes readily away from the skin, the breath becomes fetid, and the urine is small in quantity and high coloured. As the disease proceeds, the skin is marked with spots, and the emaciation increases continually, until the sheep dies. In short, the term rot expresses truly the state of the animal. The disease proceeds with various degrees of rapidity; sometimes it attacks the entire flock suddenly, and sometimes its progress is gradual, and it affects only a given number of individuals. Graziers often avail themselves of the period of the animals beginning to decline to rid themselves of an infected stock. During the first period of being tainted, the sheep have frequently a strong tendency to feed, and if killed in time the flesh may not be perceptibly affected.

In all cases of rot the disease is accompanied by a morbid state of the liver. During the progress of it, the fluke, a small animal, *Fasciola hepatica*, appears on the parts connected with the liver and the gall-bladder. At first the number of these creatures is small, but as the disease advances they increase, and before death are generally very numerous. In the last stage of the disease they have extended to the stomach and other parts.

Frequently the disease terminates favourably, the inflammatory action going off without destroying the parts. But even in this case the taint is rarely removed, and years afterwards, when the animal has been fattened and killed, the liver has been found to be diseased, the flukes being in great numbers.

The best preventive of rot is to render the soil dry; hence on all sheep pastures, the importance of draining. But should the disease, in spite of all precautions, appear, then we should, without loss of time, remove the sheep to a drier pasture, and supply them liberally with proper food. It is only, however, in the early stages of the disease, that a change of food will usually avail. If the disease has proceeded to a considerable extent, even though it should not have evinced itself by any great change in the external appearance of the flock, the animals will often perish hourly amidst the most wholesome food with which they can be supplied.

Of all the medicines that have been proposed for this fatal disease, salt alone is that whose virtue has been established by any satisfactory testimony. The beneficial effect of salt in the prevention and even cure of rot, has been confirmed by the observation of farmers in this and other countries.

Salt indeed will not in all cases prevent or cure the disease; for sometimes the tendency to it from particular causes is too strong to be counteracted, and, when it has once attacked the flock, too violent in its progress to be arrested. But though salt is not a specific, it is the best means of remedy with which we are acquainted.

If salt be placed near the animals in troughs or on flat stones, they will eagerly lick it, and when disease threatens them, it may be given to them in any quantity in which they will consume it; for it is then seen that they are obeying a natural instinct in having recourse to the remedy; and in a wet season when disease may be apprehended, no one should grudge the trouble of so cheap and simple a precaution.

Much has been written upon the subject of this disease, but all that has been written has nearly left us where we were with regard to the remedy. It had been long known that wetness of the soil, however produced, gave rise to rot; that the best preventive was pasturing on dry ground and giving sufficient food, and that the best remedy where disease appeared was a change of pasture. To these results of old experience is to be added, the using of salt.

Another disease, arising from a different cause than the rot, but like it ending in emaciation, and the death of the animal, is provincially termed *pining*. This disease is accompanied by a costive state of the animal, whereas the rot is never accompanied by costiveness; and in the rot the liver is always affected, while in the pining the liver is sound.

This disease seems to arise from the want of exercise, and from the animals feeding on very dry pastures. Before the extensive draining of the pasture-lands, where it is now found, the disease was unknown. The rot was then common; but with the draining of the lands the rot disappeared, and this new disease took its place. The former practice of management in the districts where the disease now prevails, was to keep the sheep in flocks, which were moved about along their allotted range of pastures. They are now, under a more approved system of management, suffered to spread over a large extent of pasture; and thus they are not obliged to take exercise, but are allowed to feed more on a given spot of ground.

A change of place and food is the preventive or the remedy; and if a change of food is resorted to in time, it is generally sufficient to arrest the progress of the disease. Even a removal to a fresh heath will sometimes accomplish the purpose, but the proper and effectual remedy in all cases is a change to a more rich and succulent pasture. The disease is sometimes very fatal, destroying entire flocks like a pestilence.

Sheep are subject to a long and frightful train of inflammatory diseases. In all such cases, however they may affect the animals, bleeding should be at once resorted to, as the only mean of subduing the disease, and giving a chance of safety. The eye-vein is that usually opened in bleeding the sheep; but all shepherds should be taught to bleed from the jugular vein, as being the most suitable. The quantity of blood abstracted must vary with the age and strength of the animals. The rule, in the case of the sheep as in that of the ox, is to bleed freely. The process may be continued until the pulse itself is affected, when it must be instantly stopped. Purgative medicines, too, ought to be given to the sheep, in the case of this class of diseases, and of these the most approved are, Epsom salt in the proportion of from 4 to 6 oz., and about half that quantity, or a little more, of Glauber's salt. Common salt is often applied in country practice with the effect desired. On the part of shepherds, it is to be observed, there exists a prejudice against the administration of medicines to sheep, doubtless from their having observed the little effect usually produced. But this prejudice should not be permitted to operate where the lives of sheep are in imminent hazard, as is the case in all inflammatory diseases. It is beyond a doubt that by prompt bleeding, and the judicious application of purgatives, the lives of many thousands of these valuable creatures may be yearly saved to this country.

Amongst inflammatory putrid fevers to which sheep are subject, one, termed braxy, is very destructive in various parts of the country. The progress of this disease is very sudden and violent. Of the remedies to be employed, bleeding and purging are plainly those which the nature of the disease points out. This disease seems generally to be caused by bad food, and the most efficient preventive is known to be good feeding. Turnips or other succulent roots given to young sheep feeding on natural pastures are always beneficial; and it is to be observed, that in proportion as the treatment of sheep in a country has improved, this dangerous malady has diminished.

Diarrhœa and dysentery are diseases of sheep. Diarrhœa is frequently produced by too sudden a growth of grass in spring, and it most frequently affects young sheep. It may be generally cured by removing the animals to drier pasture; and a little grain may be always given with good effects.

Dysentery is a more serious disease, and is often very destructive. In this disease, bleeding is plainly required to subdue the inflammation, and purging to carry off the peccant matter in the intestines. Hay may be offered and a few sheaves of grain laid down, and the use of mashes will in an especial manner be found beneficial.

Sheep are liable to various cutaneous diseases—diseases of the skin. The principal of these is termed scab; and it is indicated by extreme itching and eruptions of the skin. When introduced into a flock it may be attended with very serious effects, unless checked by efficient remedies.

The most common remedy for the disease is sulphur mixed with some unctuous substance to fix it on the skin. One of the best receipts perhaps is a decoction of tobacco and spirit of turpentine, with the addition of a little soft soap and sulphur vivum. The decoction of tobacco may be obtained by boiling the tobacco in brine or salt water. The liquid when prepared is applied from a vessel like a teapot with a spout, or from a bottle with a quill passed through the cork. A person lays the wool back in lines so as to expose the skin, and pours out the liquid along the lines upon the skin. But when the distemper is very violent, a mercurial preparation may be required. This is now to be obtained in apothecaries' shops under the name of sheep-ointment. It is made in balls, and when used is dissolved in oil, and applied to the skin of the animal.

Sometimes infected sheep will find their way into the best managed flocks; but every care must be taken to keep the disease from breaking out, or to cure it as quickly as possible when it appears. The infection of a diseased flock is left behind it upon the hedges and pasture-fields, and therefore precaution is to be used before a fresh flock is turned into fields where infected sheep had been recently feeding.

Another disease of sheep is the foot-rot, which is an inflammation of the foot, followed by an ulceration and destruction of the hoof. The disease chiefly prevails in wet seasons, or in soft grounds. It is a very painful disease, causing the entire lameness and loss of condition of the animal. Certain grounds are noted for communicating the foot-rot; and as it appears amongst the pasturing stock season after season, such grounds are commonly said to be infected with the foot-rot. The opinion that it is of a highly infectious nature is universal amongst farmers and shepherds. But however circumstances may seem to favour this opinion, some have conceived that it is more consistent with effects observed to regard it as connected with the state of the pasture-grounds. Yet it is difficult to resist the evidence, that, having been produced, it is conveyed to others of the flock by contact with the ulcerous matter of the diseased foot.

Although painful and destructive to the good condition of the animal, this disease is not absolutely fatal, except under entire neglect, in which case the animal becomes unable to seek his food, crawls upon his knees, and, worn away by exhaustion, perishes. But if early attention be paid, the disease admits of remedy. In the first place, let all the infected part of the hoof be pared away, and the ulcerous matter removed, and then let the foot be washed with soap and hot water, and let the surface be dressed with some caustic, of which the best is muriate of antimony. In incipient cases, by simply paring the hoof and cleansing it with soap and water, and then dipping it in boiled tar, the progress of the disease will be arrested.

The next disease to be mentioned is of frequent occurrence. This is hydatids, staggers, or water-in-the-head as it is frequently termed. The cause of this disease is a parasitic animal, a hydatid, which is found in the brain of sheep. It enlarges in size, and, if not removed, ultimately destroys the animal. This creature when distended with fluid resembles a round sac filled with water, and hence it was long supposed to be water, and the disease, in consequence, termed water-in-the-head.

When the hydatid is in the brain, the animal affected shows great symptoms of distress; he leans his head to one side, mopes by himself, continues turning round, and finally dies. The remedy for this disease is to reach the hydatid, and to extract it, or at least to perforate it in such a manner as to destroy its vitality. When it is situated at the surface of the brain, the part feels soft, and it may be reached by a sharp instrument, as a common awl or gimlet, or the hydatid itself may be extracted. This may be done by the trephine. Shepherds perform the operation in a rude manner by a sharp knife. A small portion of the scull is so cut, as to be raised up like a lid. The hydatid being exposed, is pulled out by pincers, and the fluid absorbed by a sponge or piece of linen. The skull is then replaced, and dressed with common tar put upon a piece of soft leather.

Often the hydatid may be reached by a wire thrust up the nostrils, and it is remarkable that this operation frequently succeeds in the hands of shepherds.

Sheep are liable to the attacks of various animals. One of these, a species of aphis, termed the sheep-louse, is very common, and chiefly prevails where the sheep are in an unhealthy condition. It is of a flat form, and attaching itself to the throat and other parts, occasions much irritation. Tar, turpentine, or tobacco liquor, are the substances chiefly used to destroy this animal, and any simple mercurial preparation is effectual.

But the most pernicious enemy that attacks sheep is the common sheep maggot, the larva of a species of flesh-fly. The fly having deposited her eggs on the skin of the sheep, the larvæ are hatched in great numbers, and grow with amazing quickness. They commonly appear about the root of the tail, or wherever filth has allowed the fly to attach her eggs, and thence they spread over the entire body, consuming the skin and eating into the flesh. The sheep, when attacked, manifest a strong sense of suffering. They frequently run with violence, until at length, overpowered and exhausted, they lie down and perish.

It is in moist and warm seasons of the year that the sheep-maggot is chiefly produced. Constant vigilance is then demanded on the part of the shepherd, so that all foulness of the wool shall be clipt away; and the sheep must be daily inspected, lest this dangerous enemy establish itself. The maggot is effectually destroyed by a solution of corrosive sublimate, and in its early stages by less potent applications, as by urine and lime.

We must remember that the sheep, in his domesticated state, is yielded up to the care of man; his natural instincts are blunted, and he is unfitted to use those means of preservation which in his wild state he might possess. He is the prey of a multitude of enemies, against which he has no defence; and the more artificial his condition is, the more is he dependent on our care.

The *bot*, the *œstrus* of the sheep, although smaller than the bot of the horse, is nevertheless a most formidable insect; body of a dark brown colour, spotted with white, the white sometimes prevailing so much as to give a greyish hue to the fly. It abounds most in June and July, and may be found on rails in the vicinity of clumps of trees or underwood, and may then be easily crushed or destroyed, if the farmer will but make himself acquainted with it. If only one of them appears, the whole flock is struck with terror; and if there is any place in the field devoid of pasture the sheep crowd to it, turning their heads towards the centre of the group, with their muzzles to the sand, and their feet in continual motion in order to secure themselves from the attack of their foe.

The *fly* endeavours to get at the inner margin of the nostril, and darting upon it with the quickness of lightning, deposits her egg. The warmth and moisture of the part speedily hatch it, and the little worm escapes. It crawls up the nostril, it threads all the sinuosities of the passage, and finds its way to some of the sinuses connected with the nose. The irritation it produces in its travels is exceedingly great; the poor animal gallops furiously about, snorting violently, and almost maddened by the annoyance. The worm at length reaches some of the convolutions of the turbinated bones of the nose, or the antrum or cavity of the upper jaws, or the frontal sinuses, it fastens itself on the membrane by the two hooks with which, like other bots, it is provided, and there it remains until April or May in the succeeding year. There are seldom more than three or four of these bots in each sheep; and when they have reached their appointed home, they are harmless. Some strange but groundless stories have been told of gleet from the nose, giddiness, and inflammation of the brain having been produced from them.*

Sheep, it is seen, are generally pastured in summer, and their winter keep, on all good farms, consists of an abundant supply of roots, good sweet hay, &c. with free access to air and water. Sheep require air and exercise to some extent in the coldest weather. It will not answer for us to adopt the English system of letting them run at large, for it is a well established fact, that sheep, as well as cattle, thrive better, and are not so much disposed to sickness during the summer, if they are sheltered from the storms and cold of the preceding winter. The sheep-house should be well ventilated, with a yard attached in which the sheep may exercise themselves at pleasure in all fair weather. Owing to the variety of breeds, the great diversity in the surface of our country, the variations of climate, and other circumstances combined, it is impossible to lay down any fixed or specific rules applicable to the management of sheep in all parts of the Union.

There are, however, some points of universal application—these relate to the breed or character of the animal. Every farmer should select the best and purest blood; and the treatment of his flock must be most kind and gentle; they should never be teased, worried, or submitted to the care of inexperienced persons, or persons of ill and ungovernable temper; such persons invariably do more harm than good on a farm, and the farmer should shun them as he would the rot. If your sheep have been well summered, and you have a good supply of the sugar beet,† which is the best article for fattening sheep that I am acquainted with, you will have no difficulty in carrying your flock easily and comfortably through the winter, however severe; and at the springing of the early grass they are in good condition.

It is common with some farmers to *soil their sheep*, and others, by adopting the plan of stall-feeding, think they have derived peculiar advantages thereby. The course of treatment by gentlemen who have adopted this system is given in the Appendix. These accounts cannot properly be called *experiments*, as they constitute a regular portion of farm-practice, and may therefore be considered conclusive. See Appendix.

The *age of a sheep* may be known by examining the front teeth, which are eight in number, and appear during the first year, all of small size. In the second year, the two middle teeth fall out, and their place is supplied by two new ones,

* Penny Cyclopædia.
† For the superior excellence of this root for stock, see article Beet, p. 197.

which are readily distinguished by their being of a larger size. In the third year, two other small teeth drop out, one from each side, and are replaced by two large ones, so that there are now four large teeth in the middle, and two pointed ones on each side. In the fourth year the large teeth are six in number, and two small ones remain, one at each end of the range. In the fifth year, the remaining small teeth are lost, and the whole front teeth are large. In the sixth year, the whole begin to be worn, and in the seventh, sometimes sooner, some fall out or are broken.

V. THE HOG.

Species and Varieties. Of the genus *Sus* three species are peculiar to the Old Continent and its islands:—1. Sus babyrussa—The Babyroussa, confined to the Indian Archipelago. 2. Sus larvatus—The African Boar, a very fierce and powerful creature, living in holes, and never yet domesticated. 3. Sus aper—The Wild Boar.

Of these species, the most widely distributed, and the most important, is the wild boar. He is found in Europe, Africa, Asia, and the islands of the Eastern seas. He is the parent stock of the domestic hog and its varieties.

The wild boar is a bold and powerful animal. He dwells for the most part, in moist and shady situations, and he feeds chiefly on plants and roots. In a state of nature his senses are acute, his ears very moveable, and his touch and smell so delicate, as to lead him to his food below ground, which he grubs up with his strong and flexible trunk, and this faculty he retains when in a state of slavery.

The female carries her young about four months, and she is rarely seen with the males but in the rutting season. She suckles her young for several months, and retains them near her for a considerable time afterwards, to defend them. When assailed, she protects her offspring with amazing courage, and the young reward her cares by a long attachment. She is sometimes seen to be followed by several families, forming a troop, formidable to their assailants, and destructive, by their ravages, to the cultivated fields. A remarkable contrast with the long cares of the female, is the solitary habit of the adult male, who will even, at their birth, destroy his own young,—a singular instinct of nature, given for some purpose that is unknown to us.

Although the domestic hog loses many of the characters of the wild race, he retains enough of them to prove his affinity; and all question upon the subject of his origin is removed by the change produced upon his progeny by domestication.

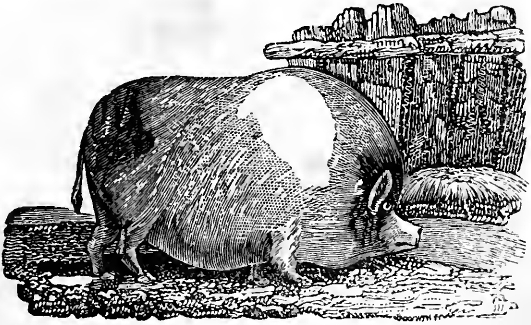
One of the most remarkable circumstances in the history of the domestic hog is, his general distribution over so many countries and distant islands, where no trace of any wild animal of the species exists in record or tradition. He was found extensively in the islands of the South Sea, when first visited by European voyagers, furnishing the principal animal food of the natives; and he exists in vast numbers in China, and the islands of the east. But what is remarkable, he is not indigenous in America, but was carried thither by the Spaniards; and he is not found amongst the quadrupeds of New Holland, though he has now multiplied greatly there. This universal diffusion he seems to owe to his extraordinary fecundity, his adaptation to every climate, and the facility with which he may be transported from one place to another.

The hog, though chiefly herbivorous in his natural state, may be fed equally well on animal food. It is this which renders him the most easily and cheaply reared of all the domestic quadrupeds.

Like the horse, the ox, and the sheep, the hog is affected in his character, size, and form by the physical state of the countries in which he is naturalized. But he is more the creature of artificial feeding than the sheep, the ox, or the horse; and hence his size is not so much dependent on the nature of the country in which he is reared. To the variations produced on him by external causes, we apply, as in the case of other animals, the term *breeds.*

Among the various articles of live-stock, few are more profitable to the breeder than swine, while the number kept on a farm is proportioned to the quantity of offal on the premises: 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 such attendance. The *characteristic marks* of a good hog are, a moderate length, as to the carcass in general; the head and cheeks being plump and full, and the neck thick and short; bone fine; quarters full; the carcass thick and full; his bristly hide fine and thin; the symmetry or proportion of the whole well adapted to the respective breeds or varieties; and above all, a kindly disposition to fatten early.

In consequence of the numerous sorts and varieties of these animals, found in almost every country, it is scarcely possible to ascertain which are the original breeds; under this head, therefore, but little more can be attempted than a brief notice of those most generally esteemed, and known under the following denominations:



The Chinese Hog.

The Chinese breed, of the general appearance of which, the above is a tolerably correct delineation, when fat, were originally obtained, as their name imports, from China. Of these there are two nearly distinct kinds: the *white* and the *black:* both are small; and although of an extraordinary disposition to fatten, will seldom arrive to a greater weight than two to two hundred and fifty pounds, at two years of age. The former are better shaped than the latter; but they are less hardy and less prolific.*

The Chinese hog is of the widely extended Siamese breed of the east, a race which extends from the Continent to the islands of Sumatra, New Guinea, and

* Complete Grazier.

others, and to all the islands of the South Seas. The true Siamese breed has the skin of a rich copper colour, but, like all the domesticated animals, the colour varies with conditions of climate, food, and culture. In China the colour is often white, and it is with the varieties derived from China, that we are the most familiar in this country.

The Chinese hog is for the most part less than the common swine of Europe and America, but it is distinguished by its peculiar aptitude to fatten. Its bones are small, its limbs short, its ears erect, its skin and bristles soft, and its general aspect delicate.

The introduction of this race has insensibly produced a great change in the character of all the breeds now cultivated. It has been made to cross the greater number of them. It has diminished the size, but removed the former coarseness of form, and increased the aptitude to fatten. The pure breed is little cultivated, and it is through the medium therefore of its crosses with the native stock, that its value is chiefly known. In this respect, the introduction of the eastern hog into other countries has been singularly beneficial.

THE BERKSHIRE BREED.

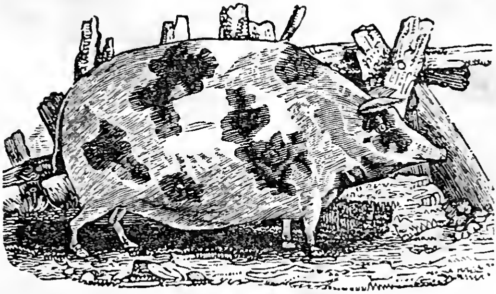
The animals from which the above figures were drawn, were bred by the late Sir WILLIAM CURTIS, and attracted univeral admiration. They were of the BERKSHIRE BREED; the specific characters of which are a reddish colour, with brown or black spots; sides very broad; body thick, close, and well formed; short legs; the head well placed, and the ears large, and generally standing forward; but sometimes pendant over the eyes. Another distinctive mark of this breed is, that the best are without bristles; their hair is long and curly, and from its rough appearance, seems to indicate coarse skin and flesh; but in fact, both are fine, and the bacon is of very superior quality. The hogs arrive at a very large size, and have been reared even to the weight of nine hundred pounds. The Berkshire was the earliest of the improved breeds of England, and is now the most generally diffused of all others, in that country and in the United States; in both of which it is very justly regarded as one of the superior breeds, combining good size with an aptitude to fatten., This improved and valuable breed has been undoubtedly formed by a judicious mixture of the blood of the Chinese or Eastern hog with the native breed of England. The great improver was a gentleman of the name of ASTLEY, of Oldstone-hall. The importation of this breed into the United States, within a few years past, has been quite extensive—it still continues—and as the Berkshire has become a general favourite among many of our farmers, we may anticipate the best results from their wide diffusion and amalgamation with the best of our present breeds.*

* Indeed, a great change has taken place in this particular, and it is a rare circumstance indeed, to meet with, at the present day, in our improved agricultural districts, even a remnant of the "old fashioned, thin, long-legged, long-nosed, gaunt-bodies, ugly race of hogs of former days." Pennsylvania has ever been noted for the peculiar excellence of her swine; but other states, it would seem are now in a fair way to take the lead.

The SUSSEX BREED is either a variety of the Essex, just described, or, as some assert, the original stock. It is smaller than the Berkshire, and of very handsome form, the general size when full grown seldom exceeding two hundred and eighty pounds. The bone is not particularly small, but it is clean; the animal is of a kindly disposition to fatten, and arrives at maturity sooner than any other kind.

The DISHLEY BREED, which were at one time as celebrated as all the other kinds of Mr. BAKEWELL's stock, are remarkably fine boned and delicate, and are supposed to be partly descended from crosses of the Berkshire and Chinese. They were certainly carried to great perfection, and have reached to considerable weight in a very small compass, being, when fat, nearly equal in height, length, and thickness; their bellies nearly touching the ground, and their eyes scarcely to be seen for fat; the whole carcass appearing a solid mass of flesh. The form of these pigs possesses considerable beauty, and is well calculated to lay on a large quantity of meat, compared with their bone and offal. They also keep themselves in good condition on a moderate quantity of food, and are easily fattened.

Such are their general characteristics; but to these merits there are said to be opposed very considerable defects. They have been found slow of growth, tender constitutioned, and to require proportionally more food in fattening than the large breeds. It should, however, be remarked, that the experiment upon which the latter assertion is founded. was made by feeding *two* Dishley hogs against *one* from a cross between a Berkshire and a large white Shropshire hog; and that while the Dishleys consumed *jointly* the most food, the other weighed singly more than the two. This, however, is not alone decisive of their respective merits, which could only be accurately ascertained by a reference to the butcher; as a material difference would no doubt arise in favour of the sale of two small animals, when opposed to that of a single large one.



THE WOBURN BREED.

The WOBURN BREED is a new variety, introduced by the Duke of Bedford, and hence sometimes called the *Bedford breed*. They are of various colours, well-formed, hardy, very prolific, kindly disposed to fatten, and have attained to nearly twice the weight of some other hogs within the same given period of time. This breed has been imported into this country, and is highly esteemed by many of our farmers; they are justly acquiring great celebrity.

Besides these there are:—

The *Hampshire*, the specific characters of which are—colour chiefly white; neck and carcass long, and the body not so well formed as the Berkshire pigs; but they fatten kindly to a very great size and weight, and make excellent bacon.

The *Northampton*, which are also white, with very short legs, ears enormously large, often sweeping the ground; size large, with coarse bone and hair, and many bristles. They fatten to a great size, but not very kindly, and are reared chiefly in the county of Northampton.

The *Shropshire*, which appear to be a variety of the Northampton race, to whose characteristics they bear a great resemblance; fattening to a large size, but not so kindly disposed as the Berkshire; yet they are both favourites with the distillers, who seem to require a coarse heavy pig to consume their wash and grains with advantage.

The *Yorkshire*, which are similar in colour to the Berkshire but with longer ears and coarser hair. They have long legs, flat sides, and are coarse in the bone; they are also slow feeders; but, for the reasons already assigned, they, as well as the Northampton and Shropshire, are in esteem with the distillers.

The *Lincolnshire*, with well-formed heads, and ears of a medium size pointing forwards, and curled at the lips; they are long and straight from the head to the tail, and of sufficient breadth; round in the carcass and deep in the sides; the skin and hair thin. The true bred pigs of this race are white, and rather tender; but they reach to thirty stone, of fourteen pounds, and in point of profit may be ranked next to the Berkshire. This breed is also well known (with some occasional variation) as the NORFOLK and SUFFOLK. The CHESHIRE, of various colours, but chiefly marked with broad patches of black, or blue, and white, have large heads, with long pendant ears; are of a great length, but proportionably narrow; curved in the back and flat-sided; large-boned and long-legged, with much loose skin, and altogether ill-formed; but they grow to an extraordinary weight, and are the largest kind of pigs in the kingdom except

The RUDGWICK BREED, which take their name from a village on the boarders of Surrey and Sussex, and are remarkable for the enormous size to which they reach; each of these breeds has its several advocates; but as their respective value does not, as in other species of stock, depend on soil and situation, these differences of opinion can only be ascribed to the want of sufficient comparative experiments, or to prejudice. A very competent, and apparently a very candid judge of the merits of the principal kinds, gives it as his decided opinion that the Berkshire rough-haired, feather-eared, curled pigs, are superior in form and flesh to all others, even to the best Chinese.

With regard to these two breeds, that opinion must have been formed on fair experiments and due consideration of their respective value, for he mentions having fatted a Chinese sow to the weight of five hundred and sixty pounds at three and a half years old, and the quality of the bacon of both kinds, fatted and cured alike, was decided by a party of gentlemen at Lord CONYNGHAM's table in favour of the Berkshire. In this we so far unhesitatingly coincide; but from all the other information we have collected on the subject, we are inclined to think that Mr. WESTERN's Essex breed, may fairly compete with either; and the Woburn breed, has not yet been sufficiently tried to admit of a decisive comparison.

To these also, there must, in justice be added, a breed partaking of the Essex blood and generally known as the *Essex* and *Hartford breed*. It was introduced by Mr. DODD, of Chenies, in Buckinghamshire, (a most successful breeder.)

The ESSEX BLACK PIG, descendents of the Berkshires, are reckoned, according to the Editor of the Complete Grazier, among the finest breeds.* He describes them as black and

* Mr. SAMUEL D. MARTIN, in a communication to the Editor of the Franklin (Kentucky) Farmer, speaks of this breed in the highest terms, and recommends them to the notice of his brother farmers, as being better adapted to rearing in that state than almost any other breed whatever. Their excellence, he says, consists in their early maturity, large size, the ease with which they fatten, hardiness, productiveness, and being excellent travellers. He states, that a pig of this breed, sold to a Mr. PHELPS, when seven months old, was weighed every ten days, and found to increase fifteen pounds, or a pound and a half per day. As an instance of their capacity to take on fat, he cites another instance of a boar, weighing two hundred and sixty-seven pounds; in thirty days he was weighed again, and was found to have *gained precisely one hundred pounds*, a fraction over three pounds per day.

white, short-haired, fine skinned, smaller heads and ears than the Berkshire; but the latter are feathered with inside hair, which is a distinctive mark of both; short, snubby noses; very fine bone, broad and deep in the belly, full in the hind-quarters, but light in the bone and offal; the sows are good breeders, and bring litters from eight to twelve. They have the character of being bad nurses. They feed remarkably quick, grow fast, and produce meat of a most excellent quality. Mr. Western, of Felix Hall, took great pains in the improvement of the race.

We have, as before observed, a variety of breeds of native growth, or crosses with foreign importation, possessing many very superior traits of excellence. E. Phinney, Esq., one of the most intelligent, public spirited, and successful farmers of this country, has on his place in Massachusetts, a variety called the *Mackey breed*, which have taken several premiums at Brighton and other fairs. This breed is very highly esteemed throughout New England, and has been introduced into New York by that indefatigable agriculturist Caleb N. Bement, Esq., who has been engaged in an experiment by crossing them with the Chinese and the Berkshire. The results have not yet transpired. For Mr. Phinney's method of treatment see Appendix.

Form.—The same external characters indicate, in the hog, a disposition to fatten as in the other live-stock; and there is no other animal which can be made by cultivation to present so great a combination of these characters, or which can be so easily improved in its form, from the facility with which it receives the character of its parents, and from its rapid powers of increase. The chest should be deep and broad, the ribs largely arched, the neck short, and the head and limbs small; the bristles should be soft, approaching to hair, and the skin soft and elastic.

Rearing and feeding.—The sow goes with young 112 days. She is fit to receive the male in the first year of her age, and the latter is able to propagate his species at the same early period, but he should be at least 12 months old before he is admitted to the female. The female produces from 5 to 10 or more at a birth, and she can easily be made to produce and rear two litters in the year; and she may even rear five in two years. She is ready to receive the male soon after the birth of her young; but the time should be chosen which allows her to produce her litter at the most convenient season. Thus, if she is to be made to litter twice in one year, the first should, if possible, be produced about the beginning of April, and the second about the beginning of September, so that the last litter may gain full strength before the arrival of cold weather.

When the sow is with young, she should not be wholly confined to a pen, but be suffered to walk at large in a yard or other convenient place, care being taken that, as the time of producing her young draws on, she shall not be crowded with others, lest she be injured by their feet.

The time when she is about to produce her litter will be known by her carrying straw in her mouth to make her bed. Before this, however, she should have been separated from her fellows and carefully littered. The straw should be short, and not in too great quantity, lest the pigs, nestling beneath it unperceived by the dam, be crushed by her when she lies down.

While nursing, she should be well fed, and the pigs accustomed to feed from a trough on milk, whey, or any liquid food, mixed with a little meal or bran.

In 30 days the males may be castrated, and a like operation, though not absolutely necessary, may be performed upon the females at the same time.

During the period of nursing, the dam and her young should be lodged dry and warm. They should be fed three times in the day with whey, milk, and a little water slightly warm, mixed with bran, meal, or any farinaceous substance, and when the pigs are in the course of feeding from the troughs, the mother may be allowed to go at large for an hour or two.

In six weeks, if they are well fed, the pigs may be weaned, but should they not have been well fed, eight weeks will be required. When weaned, they are to be fed three times a day with wheat-bran, barley-dust, or any farinaceous food, mixed with water warmed to the temperature of the mother's milk, and with whey, or other refuse of the dairy or the kitchen. In a few weeks they will begin to eat potatoes, turnips, and all other food.

The young pigs are sometimes disposed of when sucking the dam. In other cases they are sold when weaned to persons who design to feed them; and in other cases they are fed by the breeder himself.

When they are fattened by the breeder, two modes of feeding may be adopted. They may be either suffered to go at large, or they may be kept in pens and houses. By the first of these methods, after being weaned and fed for a period till they are able to shift for themselves, they are turned abroad to pick up what they can in the straw-yards, a little green food, as tares or clover during summer, and turnips or potatoes during winter being supplied to them. They do not, under this management, receive any more expensive feeding until they are put up finally to be fattened, when they are confined for a few weeks, and fed on farinaceous and other food. The pigs intended for this species of management should be the best of the smaller varieties; and they may be killed for domestic use, or disposed of when of 7 or 8 stones weight. All the accommodation required under this system of management, is a few pens with sheds; first, for the breeding swine when nursing their young; and second, for the pigs which are in the course of being fattened.

In all cases upon a farm, a certain number of pigs may be kept at large in this manner for picking up the waste of the farm-yards. But the regular course of management, and that to be adopted where the feeding of the animals is carried on on the larger scale, is to have separate feeding houses for the pigs, in which a greater or lesser number can be kept.

The same general principle of feeding applies to the hog as to the other domestic animals. The breeding stock is to be kept in good order, but not over-fed; the feeding stock is to receive a full allowance of good food from the period of weaning until it is fat.

The food of the feeding pigs is every kind of animal refuse, as that of the dairy and kitchen. Roots of any kind, raw and boiled, will be eaten by them; but it is better that this species of food be boiled or steamed. Bran steamed or boiled, is likewise a nourishing food for pigs; beans and peas bruised may be also given to them; and brewers' grains and wash furnish one of the best kinds of food that can be supplied; but the pork will not take and retain the salt as readily as that fed on more solid and substantial food. Hay or dried fodder is not relished by this class of animals: they require food of a moist and succulent kind, and therefore, though they dislike dried forage, they will not refuse hay and even straw if chopped and boiled. They feed on green food of all kinds; and hence clover, lucerne, and tares may be employed in feeding them in summer, though to fatten them finally some farinaceous or other nourishing food will be required. They will also graze like sheep or oxen, but grass consumed in this manner is not the natural food of the animal, which consists of roots rather than of herbage. The feeding of pigs on herbage, is merely to carry them on for a time till more fattening food can be procured for them. When fed on herbage, a ring must be passed through the cartilage of the nose, to prevent their following their natural instinct of ploughing up the ground, but the same purpose may be more effectually served, by dividing the tendons by which they are enabled to move the snout. Acorns and beech-mast are a favourite food of the hog, but these are rarely furnished in sufficient quantity for the purpose of feeding, though in cases where there is access to woods producing these fruits, hogs may be turned into forests with advantage. All kinds of spoiled or waste fruits may be given to them; and in the cider districts accordingly, the refuse of the cider press is employed for feeding them. In short, the animal is omnivorous, and there is not any species of animal or vegetable food which may not be given; and in the case of no other of the larger animals accordingly is the process of feeding so simple.

Pigs ought to be fed three times in the day, and the troughs in which the food is placed should be emptied before a fresh supply is given, and kept perfectly clean. It is well to vary their food, to mix it with water or other liquid, and not to overload them by too much at a time. It is a great error to leave these animals in a state of filth and neglect. The hog is not a filthy animal by choice; he delights in a clean bed; he will wallow indeed in the mire like the elephant, the rhinoceros, and other thick-skinned animals to which he belongs; but this is not because he prefers filth, but because he loves coolness and moisture.

There are two purposes for which pigs may be fattened. The one is to yield pork, which may be used either fresh, salted, or pickled, and the other is to produce bacon, which is prepared by salting and drying the flesh. When fed for pork, which is the most convenient system in the practice of the farm, the pigs may be reared to the age of 6 or 8 months; when intended for bacon, they must be reared to a greater age and size, as 10 or 12 months. When the object is pork, the smaller class of early-feeding pigs is to be preferred; when bacon is desired, the larger class should be cultivated.

In the case of feeding for pork alone, it has been computed that, upon a regular farm, with a supply of tares and clover to the animals in summer, and of potatoes and turnips in winter, and with no other feeding than the refuse of the barn, milkhouse, and kitchen, one pig may be fattened in the year for every 6 acres of land under corn crop. Thus, supposing there are to be 240 acres in corn crop, the quantity of pigs fed annually upon the farm might be 40. To feed this stock, in addition to what they can pick up in the straw-yards, about an acre and a quarter of clover, and an equal quantity of potatoes during winter, will be sufficient. To keep up the number, 3 breeding swine will be required, of which two should be sold in each year, their place being supplied by an equal number of younger ones reared upon the farm. The surplus beyond the quantity of 40, which it is proposed to feed, may be disposed of when weaned. This is a method of management practicable upon ordinary farms, without any interference whatever with the food and attention required for the larger stock.*

Another method of management may be adopted. This is to take only one litter of pigs from each sow, to sell the pigs as soon as they are weaned, and immediately afterwards to feed the swine. This will be a very profitable species of management, provided there is a sufficient demand in the district for so many pigs when weaned.

Mr. Henderson, in his Treatise on Swine, recommends this system. He calculates that 1 sow for every 7½ acres upon a farm, may be reared and fattened in this manner. He proposes that the breeder shall purchase, in the first place, 20 sow pigs and 1 boar pig, which had been born the beginning of June. In the following June all the females will have had pigs. These they are to suckle for about two months. The pigs are then to be sold just when weaned, except 21, namely, 20 sow pigs and 1 boar pig; these being selected from those which are of the handsomest shape, so that the subsequent stock may be kept good and uniform. The farmer will now be in a situation to go on without farther outlay of money for stock. In a month after the pigs are weaned and sold, the sows themselves are to be put up to feed. This will be about the beginning of September. The male must be then admitted to them so as to render them quiet and apt to feed, and in two months they will be fat and of large size.

Pigs, it has been said, may either be used for pork, fresh, salted, or pickled, when they will be ready in 6 or 8 months, or for bacon, when they will be ready in 10 or 12 months.

* Brown on Rural Affairs.

Above we have given a detailed statement of the best practice adopted abroad for the feeding and rearing of this most important and valuable animal. The practice of feeding in this country is more varied, and in some instances entirely different. Maize, or Indian corn, has long been used as the principal food for preparing swine for the market; the practice which formerly obtained, even among many of our most thrifty farmers, was to let the animals run at large, uncared for and unattended, until such times as they were to be taken up for fattening. In many instances where the animals had the range of a forest, and an abundance of nuts, they were generally in pretty good condition, and required but a few weeks attentive feeding to prepare them for the butcher; but to effect this, a much greater amount of grain was used than was absolutely necessary, it being almost universally fed out in an uncrushed and uncooked state.

Economy in the feeding of all kinds of farm stock has engrossed the attention of many gentlemen; it is a subject of vast importance, not merely to the individuals immediately interested, but to the nation at large. From a vast variety of experiments, made by different persons, in all parts of the Union, and under almost every variety of circumstance, the fact is established beyond all controversy, that so far as swine are concerned, there is a saving of at least two-fifths of the amount of the ordinary food requisite to fatten a hog, by steaming or cooking it. That is, three bushels of grain, (corn, for instance,) properly prepared by cooking, will go full as far towards fattening a hog as five bushels in its raw and uncooked state.

The result of an experiment is found in the Annual Report of the Agricultural Society of Maryland, instituted for the purpose of determining the relative value of the two methods of feeding. We subjoin the statement: it speaks for itself.

On the first day of December four shoats of the same breed, nearly of a size, and as much alike in every respect as could be selected from a herd of ninety odd hogs, were made choice of; each carefully weighed, and placed in a single stye where their food could be exactly regulated. They weighed between 81 pounds and 100. The two whose weights together made 185 pounds, were fed on one gallon of shelled Indian corn, weighing seven pounds to each, for every 24 hours, and as much water as they wanted. This quantity of food was sufficient for them; generally they about consumed it. Some five or six different days between the 1st of December and 4th of January, the time the experiment was going on, they did not eat their whole allowance.

For the two shoats, whose weights together made 173 pounds, seven pounds of good Indian corn meal, by measure ten pints, were made into good mush, or hasty pudding, and divided between them for every twenty-four hours. That is, these two had allowed them exactly half the weight of meal which the others had of raw corn. The seven pounds of meal were daily mixed with scalding water, and then well boiled; the whole process of cooking was done on an average in 1½ hours. They were all fed twice a day and at the same time. The evening feed of the shoats fed on mush was generally warm —the morning feed, having stood all night, was generally cold. The seven pounds, or ten pints of meal, when cooked, weighed an average of thirty pounds, and measured an average of three gallons. There was a difference of nine pounds in the weight of the latter pair—the smallest had the least appetite, and his allowance of fifteen pounds of mush was just as much as he appeared to want or would eat up clear; the other was greedy, and always sharp set, despatched his mess quickly, and wanted more.

Before the experiment had progressed a fortnight, there was a very perceptible difference in the appearance of these pigs. Those fed on the mush assumed a more thrifty, healthy, fresh appearance, particularly of their hair, and this difference appeared more striking as the experiment advanced.

On the 4th of January, while preparations were making for killing and dressing, they were again weighed on the hoof. One of those then whose daily allowance had been 7 pounds of corn each, had increased 20 pounds in the 24 days: the other, which had had an equal allowance of corn, had increased only 5 pounds. I could not account for the difference by any thing I could discover, either before or after killing; the appetites of these two were much more alike than of the others; and their health was apparently equally good.

Of the pair fed on mush, whose daily allowance had been 3½ pounds of meal each, the greedy one had gained 23 pounds and the other 21 pounds.

These are all the material facts in these experiments, except that a very small portion of salt was put in each mess of mush—and there is no miracle in them. The hogs allowed 3½ pounds of each gained less than three-fourths of a pound daily, but it was more than those fed on double that quantity of corn gained.

The soiling of swine has been referred to in our notice of the English practice. The late Mr. Lorain, from a partial experiment, a short time previous to his decease, was forcibly impressed with its importance. And the plan of making your *hogs work*, as adopted by Mr. Phinney, Mr. Ingersoll, the late Charles Vaughan, of Maine, and many others, is an admirable one. The manure they produce is of the best kind, and with judicious management large quantities may be easily obtained. (See Mr. Phinney's statement, Appendix.) But when this practice is adopted, too much regard cannot be paid to their comfort, and no animal will afford a more generous return for the care bestowed upon it than the hog. William Penn Kinzer, Springlawn farm, Lancaster county, Pa., in an interesting paper, communicated to the Editor of the Farmers' Cabinet,* says:

The conviction, that very much of the nourishing property of grain is lost by the process of fermentation and distillation, and yet aware of the aptitude of all kinds of stock to fatten on the swill of distilled grain, after the essence or volatile spirit has been extracted, I conceived the plan of *boiling* the grain, after being chopped, to be fed sweet and fresh; conjecturing that a given quantity of grain thus prepared would be converted into the greatest possible weight of flesh.

He here gives his process of boiling, and then says, "by this method, cattle and hogs are fattened in half the time that is required on raw grain, and with an economy of grain aston-

* Farmers' Cabinet, March, 1839. The reader will find an interesting paper. Mr. K. confines *steaming* to the entire family of roots.

ishingly great. * * * My fondest hopes are more than realised."*

All the varieties of grain, and almost all kinds of roots are now extensively used in the fattening of swine, but in general undergo the previous process of cooking in some shape or other. The potato, sugar-beet, ruta-baga, mangel-wurtzel, parsnep and carrot are severally brought into profitable requisition. Apples, both sweet and acid, afford a very agreeable food for swine; and large numbers are fattened almost entirely upon them with the addition of a small portion of prepared grain for a few weeks previous to slaughtering them. Harvey Baldwin, of Hudson, Ohio, has adopted this process of fattening with marked success, since 1833. Pain Wingate, a practical farmer and a highly respectable member of the Society of Friends, says, "I last year fattened an old hog and two pigs upon apples, with the addition of fourteen bushels of oats and pea-meal, and one bushel of Indian meal. When I commenced feeding them, which was the 10th of 8th month, 1835, they were in rather poor condition. I fed the pigs three months, and they weighed at seven months old, one hundred and thirteen and one hundred and twenty-five pounds. The hog I fattened four months, and when he was nineteen months old he weighed four hundred and fifteen pounds." My old and worthy friend David Comfort, of Byberry, assures me that he has every confidence in fattening hogs on apples, and that he has put up pork fattened on apples until the two last weeks, when corn was substituted; and the pork was as sweet, solid, and well flavoured as any he ever saw. Innumerable instances could be adduced of the value of apples in the feeding of swine, but these are deemed sufficient.

Judge Peters recommended the presence of some dry rotten wood in the pens in which hogs were put up for fattening; that their food be soured by a proper degree of fermentation; and that the superiority of swill so acidulated, for fattening, is as one gallon of the sour swill to two of the sweet. "Charcoal or rotten wood, containing a large quantity of pyroligneous acid, should be kept constantly in the pen; and salt should be placed within reach of the hogs twice or thrice every week."†

The Farmer's Assistant very judiciously remarks, that whatever method may be adopted for fattening swine, it is essential

* Care must be observed in selecting the kettle or boiler; iron is preferable, as it is well known that copper, or copper and lead, are highly pernicious, generating poison. Whenever, therefore, boilers of this description are used for the cooking of food, of whatever kind, they should be immediately emptied, and instantly cleansed.

† T. W. Johnson, Esq.

that they be kept warm and clean. They should be well littered, and as much substantial food and drink as they require should be administered to them at regular intervals or periods. They should be frequently curried; and in every stye or yard in which pigs are kept, there should be erected a rubbing-post, the advantages of which are too apparent to need any notice.

When rearing swine a small quantity of nutritious food given with lucern, clover, tares, &c. is sufficient; but when put up to fatten, a constant supply of the most wholesome and nutritious food should be provided.

The hog, if we regard the multitudes of mankind who feed upon its flesh, occupies, it will be seen, an important place in the domestic economy of all civilized countries. His flesh is perfectly nutritive, and, from its ready reception of salt, it is better fitted for preservation than that of any other animal—it is therefore largely used for sea voyages, for which purpose it is eminently adapted. It forms a very large portion of the animal food consumed by the inhabitants of Europe; and from the great facility with which it may be raised by the humble cottager as well as the breeder on the larger scale, it has very aptly been styled the poor man's stock. He is, beyond every other animal, quickly multiplied, reared, and brought to the required maturity; and it is a great error for a farmer, however extended his concerns may be, to disregard this branch of farm stock—it is to him a source of household economy and comfort. He can raise the most delicate pork for use at all times, and with the greatest facility; and will always derive a sufficient profit by the sale of the remainder to repay him in the most ample manner for his feeding, and induce him to give attention to this branch of economy.

DISEASES INCIDENT TO SWINE.

Swine are liable to but few diseases; but inasmuch as they are very bad and unruly patients, it is exceedingly difficult to treat them in a proper manner. Fortunately, however, a system of proper management, a regular supply of wholesome and nutritious food, with a due regard to cleanliness, will in general ward off all disease; and the necessity of attending with the greatest degree of strictness to these matters cannot be too forcibly impressed upon the mind of every farmer.

The garget is an inflammatory affection of the udder; the lacteal ducts, by which the milk is conveyed, being obstructed by an accumulation of coagulated milk; and as young pigs will not suck when the milk of the dam becomes vitiated, the corrupted milk must without delay be expressed gently by the hand. But when this cannot be effected, which is often the case, there is but one alternative—that is, to kill the sow, as she must inevitably perish.

Garget of the maw arises from over-feeding and retained dung, by which the stomach and intestines are greatly distended, with much pain to the animal. *Receipt:*—Give one or two drachms of jalap; repeat, if necessary, administering at the same time a clyster of warm water and common salt.

The measles is a disorder mostly confined to the throat, which is filled with small pustules; these sometimes appear on the outer surface of the neck, and it is found to affect the grain of meat when killed. It is the disease most common to the hog, and is easily recognised by the languor and decline of the animal. It is readily removed by giving small quantities of levigated crude antimony in his food.

Diseases of the lungs are mostly attended by a dry, hard, husky cough, and a wasting of the flesh. As these diseases generally arise from exposure to cold and wet, the best remedy is a warm, dry pen; and their food, which should have a tendency to keep them cool and prevent irritation, should be given to them with regularity, but not in too great quantities.

The murrain or leprosy in swine is known by the shortness of breath, a hanging of the head, staggering, and secretions of viscid matter from the eyes. The origin of this disease is attributed to an inflammatory state of the blood, frequently occasioned by a long continuance of hot weather. *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 aniseed, three ounces of liquorice, and a quarter of a pound of elecampane. Give this liquid in milk, in six doses, and keep the animals on good wholesome food. Keep your animals cool and clean in summer, and you will not probably be troubled with this disease.

The staggers is a disease to which swine are liable; during its paroxysms they turn round with amazing rapidity, and very often, if relief is not afforded, die in half an hour. The Farmer's Assistant furnishes the following remedy, on the authority of Mr. De Gruchy. On opening the mouth a bare knob will be discovered in the roof of it; cut this away, and let the wound bleed; make a powder of loam and salt, rub the wound with it, and then give the beast some urine, and he will presently recover.

Dry cough and wasting of the flesh is corrected by a warm pen, and a regular supply of cooling and wholesome food.

The mange in hogs, like the scab in sheep, is a cutaneous eruption, brought on by the foul state of the pens or enclosures, and most generally denotes a slovenly farmer. This inference does not always follow: we have known instances in which it has been introduced into our best farms by the purchase of animals having it in its incipient stages, when it could not be detected. It is indicated by the violent rubbing of the diseased animal against any hard substance, and with such violence as to tear away the head of the pustule, and to produce a disagreeable scab. On the first appearance of this disease, the infected animal must be instantly removed to a considerable distance from the others, washed thoroughly with a strong soap-ley, and anointed with the following preparation, recommended by Dr. NORFORD. "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 supposed sufficient for a hog weighing from eight hundred to a thousand pounds; and if properly applied, no repetition is necessary, provided the hog be kept perfectly clean after the cure is performed. It sometimes happens that from long neglect, the ears, neck, and other parts become ulcerated. In this case 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 the mixture while hot.

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

CURING OF PORK AND HAMS.

This is a very nice process. A great diversity of practice prevails throughout the country. Some sections, as Burlington county, New Jersey, for instance, are justly celebrated both at home and abroad for the peculiar excellence of their hams. Virginia bacon has also obtained great celebrity. As the practice of curing both pork and hams is so various, all we can promise or undertake is to give the different processes adopted by experienced and practical men. The following method has been practised for a number of years by T. W. JOHNSON, Esq., of Auburn, near Frederick, Maryland, with the best results, his hams rivalling in excellence and flavour the Burlington and Westphalia hams. He says:

In order, then, to have GOOD *bacon*, it is necessary to have GOOD *hogs*. By good hogs I mean those of an approved breed, of proper age and size; much more depends on the breed of the hog than is generally supposed, and much, very much upon the age and size. The most approved breeds for bacon, are the cross of the Parkinson with the Siberian, or the Chinese with our common stock; the meat is more delicate in flavour and taste, and easier to be raised and kept fat. Hogs from fifteen to eighteen or twenty months old, are the best ages; and weight from one hundred and thirty to one hundred and eighty pounds. Hogs of less age than twelve or fifteen months, have too little firmness and solidity to retain their juices, and after smoking become hard and dry; the same objection holds good as to weights under one hundred or one hundred and twenty. Hogs of two hundred pounds or upwards are too thick and large to be thoroughly salted and smoked; consequently difficult to preserve any length of time.

Unless the weather is so cold as to endanger its freezing, the hog, after being slaughtered, is suffered to hang out all night so as to become thoroughly cold and stiff, when it will cut up much more smooth and neat. In cutting up I make six pieces from each hog for salting, the feet should always be sawed off instead of being cut off with an axe or cleaver, as it will leave a smoother surface and prevent any place for the lodgment of skippers. The feet should be cut off a little below the joint. The next and most important matter is the salting. It is almost impossible to find two persons who agree as to the best mode; some use fine, some coarse salt, some cayenne pepper, some sugar, some molasses, some nitre, and some none, and some again prefer brining. But as I have promised to give you my method, I shall proceed to do so. After cutting up my pork, I select my hams and shoulders, lay them side by side, skin down, on some loose planks elevated at one end to permit the blood to drain off freely; they are then salted, or what is called sprinkled, with the best clean Liverpool ground alum salt. After remaining in this situation for two or three days, or until they become perfectly white, they are then taken up piece by piece and laid on a clean table; to each ham and shoulder, according to size, I put two tea-spoonsful or more of finely pulverized nitre, rubbing with the hand both the flesh and the skin side; it is then well rubbed with salt and laid in a clean tub—after putting in as many pieces, side by side, skin down, as the bottom of the tub will contain, I fill up all the interstices with salt, then another layer of meat and salt, and so proceed until the tub is full. In four or six weeks, in a good cellar, it will have absorbed as much salt as it ever will; (you see from this remark, I do not believe in over-salting hams and shoulders.)

Ten days or a fortnight, before taking out of the tubs, I have some young green hickory wood cut and burnt by itself, the ashes collected and sifted; after taking the meat out of the tubs and wiping it dry with a clean coarse towel, it is laid in a wooded box sufficiently large to contain two pieces, the hickory ashes thrown over them and well pressed on with the hand; it very soon forms a hard incrustation over the meat and prevents as well evaporation, drying and dripping, and is also one of the best preventives against bugs and skippers. After hanging in the smoke-house for a day or two, the operation of smoking commences, which I continue for three months, or until the first appearance of the *green bottle fly*. My meat is smoked exclusively with green hickory wood; the green oak will answer very well. It cannot be smoked too much, though with the smoke there should be as little heat as possible; the largest pieces should be hung more immediately over where the fire is made. Early in the spring, say the first of April, or earlier, should the weather be warm, or you discover any of those *green coat gentry* about your meat-house door, take down your hams and shoulders and pack them away in your salting tubs, placing between each layer of hams or shoulders, pieces of lathes to prevent too much pressure or coming too much in contact, otherwise they will be apt to mould where they press one upon the other. After filling your tubs in this way until about one foot from the top, fill it up with hickory ashes pressed close.

This is Mr. Johnson's experience and practice for years past, and in communicating it, he very aptly remarks, that there is "really as much art in *cooking* a ham as there is in curing it." The best ham ever cured may be wholly spoiled by injudicious cooking.

One of the best and most successful farmers of Philadelphia county, recommends the following process, the excellence of which he is fully satisfied of by several years experience. It is still his favourite and only method. For curing pork, two hundred pounds—fifteen pounds of Liverpool salt; eight gallons of pure soft water; one pound brown sugar; four ounces saltpetre; one quart ley.* These ingredients are to be mixed with the water *cold*, well stirred and skimmed, and put over the pork cold, no fire being used about the process. The pork is to be packed in a cask, and between each piece sprinkle a little fine salt. Then pour over your pickle, and let it stand until the pork is salted to your taste—usually about four weeks are sufficient. The pork should be rubbed with salt, and laid on shelves long enough to become perfectly cool previous to being consigned to the pickle tub.

Meat that is to be dried and smoked requires less salt than that which is to remain in pickle, on account of the preserving qualities of the pyroligneous acid, which is supplied by the smoke of the wood. The great art in smoking meat well, seems to consist in having the meat dried by smoke and not by heat. The hams of Westphalia, unrivalled in reputation, are managed in this way. The farmers have a closet in the garret adjoining the chimney, made smoke-tight, in which they hang their hams and bacon to dry without the influence of heat or fire. The smoke is conducted into this room through a funnel inserted in an aperture of the chimney. There are two, one for admitting the smoke, the other for passing it off. There are a number of similar establishments in Chester, Berks and Lancaster counties.

The hams of some of the European states are highly extolled. In Germany, Spain, and in some other places they are remarkably fine flavoured, and are frequently spoken of by travellers in those countries. A large quantity of sugar is used along with the saltpetre in curing them, which not only aids in the conservation of the flesh, but also renders it peculiarly mellow. In many of the old countries sugar is very generally put into the water in which the hams are boiled, as it is found to render them more tender.

The smoked flavour, which by many persons is considered an improvement, may be readily imparted to the hams by rubbing them with the pyroligneous acid, which acts also as a great preservative of all kinds of flesh from putrefaction. It may now be had in the shops.

* The same receipt answers for a like quantity of beef, substituting twelve for fifteen pounds of salt.

VI. DOMESTIC FOWLS.

The domestic fowls reared for food are divided into two divisions, viz: 1. *Gallinacea*, the cock kind, comprehending the common cock, the turkey, the Guinea-fowl, the peacock and the pigeon. 2. *Palmipedes*, the web-footed kinds, embracing the duck, the goose, and the swan.

The breeding and rearing of domestic poultry, as one of the branches of rural economy, includes two special, though different objects. The first is that of rearing poultry for amusement, and for the table of the owner; and the second is doing the same thing with a view to profit. In France, and other European countries, the raising of poultry is conducted on the large scale, in establishments erected for the purpose, and in the successful management of which no pains nor expense are spared.*

The *Cock*, which may be regarded as a real blessing to humanity, is the first in importance of the gallinaceous kind: to what region he originally belonged is unknown to us, as the period of his servitude is hidden in the remotest ages of the world. He is found from the equator to the limits of the temperate regions; in some places very abundant, and sometimes of large size and great beauty. The male of the domestic species, says Professor Low, were we not daily familiarized with the sight of him, would appear to be a very graceful bird. His gait is erect, his eyes are sparkling; he is armed with spurs for his defence, and he is endowed with a courage which often causes him to die rather than yield to an enemy.

The female is remarkable beyond all other birds for her fecundity; she continues to lay eggs throughout a great part of the year; the period in which she ceases to do so, or does so very sparingly, is that of moulting, which generally lasts from one to three months. After having laid a certain number of eggs, the desire of incubation takes place. This is indicated by strong emotions, and a peculiar cry; and she will sit on any eggs that may be presented to her. Many expedients, some of them very cruel, are practised to check the instinctive passion, so as to cause the animal to lay eggs rather than to hatch.

It is remarkable that while some of the females show this desire in the strongest manner, others scarcely manifest it, or, showing it, it quickly leaves them. Hence, while some are engaged in producing eggs, others are ready to serve the office of mother, and on this account there is no kind of the domestic fowls that can be propagated so quickly, and in such numbers.

The period of hatching is 21 days. The female during this time manifests increasing watchfulness. She will scarcely be induced to forsake her charge, even by the most pressing claims for food, and hence food should be placed within her reach. The number of eggs which one mother is allowed to hatch, is generally from 10 to 15.

The young is gradually nourished within the shell. It lies without motion; its position is remarkable; its breast is towards one end of the egg, which

* Main on Poultry.

is formed large for that purpose; its legs are bent forward to the breast; its head is couched beneath one of its wings; and its beak rises from between the wing and the back.

When the time of its maturity is at length arrived, the desire of life and motion awakes. The little creature employs its beak, thus singularly placed, for the purpose of breaking its covering. It is heard to tap the shell; the emotions of the mother increase as she listens to the attempt of the young to come forth. The beating of the beak is generally continued for 2 hours, sometimes for 6 hours, and sometimes for a longer time. At length the shell is broken, and the young is enabled to come forth from its marvellous mansion.

The anxious mother has no milk to give to her young when they come into day; but Nature has provided for all their wants. The mother teaches the young to find their food almost as soon as born, and their little bills are sufficiently hardened at their birth to pick it from the ground.

The change of nature in the parent is very remarkable. From the most timid of creatures, she now becomes fierce and courageous; she will attack the largest animal in defence of her young; she watches them with surprising solicitude; she shelters them under her wings, and leads them where food is to be found. After a time her cares cease; she gradually recovers her natural timidity; she finally resumes all her habits, and leaves her long-cherished offspring as if never to know them more.

The varieties of the common fowl are very numerous, and distinguished from one another by their size, colour, and fecundity. 1. The GAME-FOWL is a very singular creature on account of its habits. Size less than that of the common fowl, symmetry of its limbs greater, and the beauty of its plumage remarkable, when not mutilated for the barbarous sport for which it is destined. Its flesh is white, and esteemed beyond that of all the common kinds for its delicacy and flavour; but the singular pugnacity of disposition, which shows itself at the earliest period of life, deters all breeders rearing it except for the purpose of gaming. Whole broods, scarce feathered, become blind from coutinued fighting. They cannot be employed for crossing the common fowl. 2. The DORKING-FOWLS, so named from a town in Surrey, are the largest and finest of our domestic breed. Their colour is wholly white, their body is capacious, and they are prolific layers of eggs. They are distinguished by having five claws on each foot. 3. Equal to the Dorking in estimation, are the POLAND fowls. Their colour is black, heads flat, and surmounted with a crown of feathers. They are a very useful variety, prolific of eggs, but less inclined to set, than those of any other breed. 4. The BANTAM is a little Indian breed, very delicate to eat, but, from the smallness of its size, not of any economical importance. 5. The CHITTAGONG or Malay fowl, is the largest variety of the species, but the flesh is regarded as inferior to those described.

When it is wished to form a *breed of fowls*, the breeding should be from a young stock. Hens are at their prime at three years old, and decline after the age of five. The best period to commence breeding is in the spring. The number of hens to one male from four to six, the latter being the extreme number—more are sometimes allowed, but it is a bad practice.

The methods of feeding fowls are various. The most common, where raised in ordinary numbers, is to suffer them to range about the homestead, in which case they are termed barn-door fowls. Whether they are suffered to roam at large or are confined, there should be a poultry yard, where they may be regularly fed; and this should be properly laid out, on dry ground, well gravelled, and supplied with good water, and the whole well sheltered from the north and east. In this yard should be placed a quantity of dried sand, or effete lime—a mixture of both would be best, that the fowls may indulge the propensity so natural to them of rolling, basking, and dusting themselves.

A *poultry house* is indispensable to the profitable management of the business. In this the animals will roost, lay their eggs, and bring forth their young. Its situation should be dry, and its position such as to enjoy the sun's rays in winter as soon as he rises above the horizon. Cold not only benumbs fowls, but also retards and diminishes their laying—the want of pure water gives them the pip, costiveness, and other inflammatory diseases. Indeed, an infectious atmosphere causes them to droop, whence it naturally follows that their fecundity is less, that the flesh is not of so good a quality, and their rearing is attended with difficulty. Under these circumstances one may judge how important it is, for the improvement of poultry, that it should be wholesomely, comfortably and cleanly housed. To centre every advantage that can be wished for in a poultry house, it is essential that it be neither too cold in winter nor too warm in summer; the fowls must take a liking to it, and not be tempted to go to roost and lay any where else. Its size must be proportioned to the number of fowls, but sooner smaller than too large, for in winter they electrify, and impart their own warmth to each other.

Arthur Young was of opinion, that where a set of houses are intended, a situation should be selected near or close to the farm-yard, or to the east, rather near, but not too much so to the farmer's house, and with ample space around for the fowls to disperse over in the day time, and one or more ponds, if there are any of the aquatic sorts. All must have access to a gravelled yard and to grass for a range, with an abundance of clear pure water. Great attention should be paid to cleanliness and white-washing, not for appearance, but to destroy vermin. James Main, in his Treatise on Poultry says, of whatever size the building may be constructed, it should be raised a foot from the ground, walls thick, well plastered, white-washed inside and out, having neither chinks, crevices, or cavities, which leave room for martins, weazels, rats, and mice, and even insects to get in, and to remain there. The roof that covers it juts out very much, sheltering it from wet, the most dreadful scourge of fowls; the door is small, above which is an opening by which the fowls have ingress and egress by the aid of a ladder; they thus go easily to roost, as the roosts are fixed purposely on a level with this opening. There are two circular windows, the one to the east, the other to the west, furnished with a very close netted grating, and an outside shutter. This description, it will be remembered, applies more particularly to a house of the following dimensions —twelve feet in length, ten in width, and the same in height.

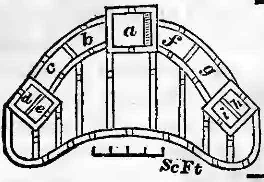


Fig. 37.

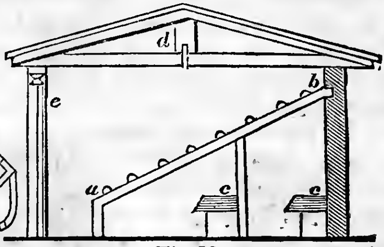


Fig. 38.

Mr. LAWRENCE, who wrote a volume on the Treatment of Poultry, under the assumed name of *Mowbray*, makes the following observations on the construction of poultry-houses. A space thirty by fifty feet may be made choice of for the buildings and yards; the building may be ranged along the north side, and the three other sides enclosed with a trellis or slatted, or wire fence, from six to eight feet in height, and subdivided with similar fences, according to the number of apartments. The hen-house (*a* fig. 37) and turkey-house (*b*) may have the roosts (*c*, *c*) in part over the low houses for ducks (*d*) and geese, (*f*, *g*, *h*) and besides these there may be other apartments for hatching, or for newly hatched broods, for fattening, to serve as an hospital, or for retaining, boiling, and otherwise preparing food, killing poultry and other purposes. A flue may pass through the whole for moist or very severe weather; and the windows ought to have outward shutters, both for excluding excessive heat and excessive cold. In every apartment there ought to be a window opposite to the door, in order to create a thorough draft, when both are opened, and also a valve in the roof, to admit the escape of the hottest and lightest air. Every door ought to have a small opening at the bottom, for the admission of the fowls when the door is shut.—The elevation should be a simple style, and there may be a pigeonry over the centre building. The roost is sometimes a mere floor or loft, to which the birds fly up or ascend by a ladder; at other times it is nothing more than the coupling timbers of the roof, or a series of cross battens or rods, rising in gradation from the floor to the roof. The battens should be placed at such a distance horizontally as that the birds, when roosting, may not incommode each other by their droppings. For this purpose they should be a foot apart for hens, and eighteen inches apart for turkies. The slope of the roost may be about 45°, and the lower part should lift up by hinges in order to permit a person to remove the dung. No flying is requisite in case of such a roost, as the birds ascend and descend by steps, see figure 38, in which (*a*, *b*) are spars for the poultry to sit on (*c*, *c*) ranges of boxes for nests, (*d*) the roof, (*e*) the door, which should be nearly as high as the ceiling, for ventilation, and should have a small opening with a shutter at bottom, to permit the poultry to go in and out at pleasure. The spars on which the clawed birds are to roost, should not be round and smooth, but roundish and roughish like the branch of a tree.

Feeding-houses, in which are troughs with water and food placed all around, so that the fowls may feed constantly and without interruption, must be employed when fowls are reared in large numbers for sale. Poulterers know how to feed fowls with great expedition; and their method seems to be to give every kind of nourishing food. It is, indeed, under every circumstance, the rule of experienced feeders to give them a full allowance of food from their birth to their maturity.

Fowls are, of all birds, the most easy to feed, every alimentary substance agreeing with them; and they are seen the whole day long incessantly busied in scratching, searching, and picking up a living. No seed, however minute, can escape the piercing looks of a fowl. The fly most rapid in flight, cannot screen itself from the promptitude with which she darts her bill; while the worm which comes to breathe at the surface of the earth, has not time to shrink from her glance—it is immediately seized by the head and drawn up. Fowls that are thus feasted on seeds, worms, insects, and every thing else that may be found in a close and diligent search in the yard, barns, stables, and cow-houses, only require, in general, a supplementary feed, which is best distributed to them in the morning at sunrise, and before sunset in the afternoon. This meal is prepared in the following manner, according to Main.

On the day before, boil in the washing of dishes such pot herbs as the season affords; let them be mixed with bran, and then drained. On the following day this paste is warmed up and given to the fowls; after they have eaten of it, give them some of the siftings of wheat, rye, barley, buckwheat, or Indian corn bruised or cracked, and such crumbs and refuse matters as generally collect in the kitchen. The evening's meal should be similar to the morning's.

Indian corn, wheat, barley and oats are all employed in the feeding of poultry; but to fatten them on these articles, or even to keep them for the product in eggs, will prove an uphill business. It cannot be done to any extent with profit; and hence it is that so little attention is paid by our farmers to the raising of poultry. Poultry, all know, will feed on any kind of farinaceous substance, and the better the quality of the food, the more will they profit by it. It should be the object, therefore, of those who engage in the business of rearing poultry on a large scale, to study sound economy in feeding them, otherwise they will sustain loss. But there is no necessity for this great expense. Boiled potatoes, with the addition of a very small portion of Indian or barley meal, and with an occasional feed of cracked or boiled corn, will not only keep the flock in good condition, but will in a very short time produce a rapid degree of fatness. The knowing ones, as they are called among our farmers, who deal largely in poultry, fatten them altogether in this way. It is a saving of at least seven-tenths over the old method.

The cramming of poultry consists not only in feeding them with all the great variety of substances which they are known to consume, but in thrusting them down their throats. The ingredients employed are made into little balls, and the fowls, kept in coops, are crammed night and morning. In this way they are fattened in a remarkably short time, but the practice is unnatural, and in some degree cruel; and therefore fattening them in freedom, and as they naturally choose, is a more certain way of procuring pure healthy birds. The practice adopted by some foreign poulterers of depriving them of sight, and light, and motion, by confining them in narrow baskets, while they are superabundantly crammed, is so barbarous, and revolting to humanity, that it is to be hoped the horrid custom will never find an advocate on this side of the water.

In fattening poultry, the quality of the food is a principal thing to be attended to; for if the ingredients on which they are fattened be otherwise than sweet, the flesh of the fowls will be deteriorated. Many persons suppose that it will answer to feed with any of the refuse of grain or any thing else they will eat. This may answer the purpose of the feeder for a time, but he will eventually lose his credit in the market. Many of the above observations on the treatment of the barn-door fowl are applicable to those about to be mentioned.

EGGS are an extensive product of common poultry; they form an object of vast consumption, and are produced in numbers not to be computed. The eggs of the common hen are the only ones that may be said to be in daily use; not simply because they are the best and the most delicate, but also because they are, of all females in the poultry-yard, the most numerous, the most fruitful, and the most easy to rear. They are decidedly one of the best and most wholesome articles of food within the reach of man. They are also used for a great variety of other purposes than food. The eggs of the common hen only constitute an article of commerce.

From five Poland hens, Mr. LAWRENCE obtained, in eleven months, five hundred and three eggs, weighing, at the average of one ounce and five drachms each, fifty and a half pounds. From this will appear the great production of animal food from this source. In the year 1838 an account was kept with a dozen of our best fowls; they were well and *regularly* fed on boiled potatoes, with occasional supplies of other kinds of food; they were well kept, and carefully guarded against wet. The produce for the year was two thousand three hundred and twenty-eight eggs, and one hundred and three chicks. Two thousand of the eggs were sold at the average of twenty cents the dozen. A portion of the young broods was disposed of, producing nine dollars and seventy-five cents, after subtracting all the expenses of preparing them for market. To preserve eggs, the pores of the shell should be rendered impervious to the air. Unctuous substances of different kinds are employed for this purpose, as suet, melted oil, and the like.

Turkeys.—Next to the common fowl, turkies form the most numerous tribe, and at the same time the most useful of the farm-yard. They are natives of North America. About the commencement of the sixteenth century (1525) they were introduced into England—first eaten in France at the marriage feast of Charles IX., in 1570, at which period they were already common in Spain; and so rapidly were they propagated in England, that we are informed that in the year 1585 they were not only scattered over the whole kingdom, but had become a common dish at country feasts. In those early days he was called the Indian Cock, and sometimes the Peacock of the Indies.

In his wild state, the colour of the turkey is black, variegated with bronze and glossy green; and his quills towards the ends are tipped with white. By domestication he acquires that variety of colours which we see him to possess. In his native woods, the turkey is found in large flocks; he roosts upon the highest trees, and becomes an easy prey to the hunter; he retires before the progress of the settler, taking refuge in the boundless forests of the interior.

The turkey is an important addition to the domestic fowls. There is but one species of the domesticated turkey, but great varieties, distinguished chiefly by their size and colour. The turkey is more tender, and difficult to rear, than the common domestic fowls. The hen lays a considerable number of eggs in spring; the period of her incubation is 30 days; and from 10 to 15 eggs are usually assigned to one female. She will sit upon her eggs frequently without the desire to leave them, and hence the propriety of supplying her with water and food while sitting. Her cry at the period of maternal solicitude is plaintive and expressive, but she treats her young with less seeming care than might have been looked for. She travels with them very fast to great distances, and often leaves them straggling behind her; hence it is usual to confine her to a coop till the young have acquired strength to follow her. And frequently even, on account of her wandering habits, her eggs are given to be hatched by a common hen. She is wonderfully vigilant when birds of prey appear; and by a peculiar cry, gives the alarm to her brood, which instantly seek for shelter, or couch themselves upon the ground.

As soon as the young are hatched, they must be withdrawn from the nest, and kept warm. The hen and brood must then be housed for some time, after which she must be cooped during the day in the open air, till the young acquire strength to follow her. During this period the young are fed on farinaceous food, kneaded with water, and mixed with cresses, nettles, or other green herbs, cut small. Though they are tender at first, yet when half-grown, and well feathered, they become hardy, and will range abroad, providing themselves with insects and other food; but care must be taken that they be well fed when let out in the morning, and when they return in the evening. It is to be observed, that if a large wood be near, the creatures, with the instinct of their race, will stray towards it, without any seeming wish to return.

When they are put up for final feeding, sodden barley, or the meal of oats, barley and wheat, are their appropriate food. A common practice is, after they have been allowed to glean in the stubble-fields in autumn, to put them up for fattening. A good weight for a turkey is 15 lbs.; but they are sometimes fed to 20 and even 30 lbs. The abominable process of cramming is sometimes also adopted with the turkey, and thus it is compelled to become fat in the shortest time. The eggs of the turkey are regarded as delicate by those who are used to them, but they are not much an article of consumption.

These birds are exceedingly voracious, and if grain merely were given them, greedy as they are, they would merit the appellation of wheat-coffers. But there are other modes of feeding them, better and infinitely cheaper. Neither are they as much trouble or impose as much care on the breeder as some imagine. They are these: In the first days of the life of the turkey, to secure it from the alternations of heat and cold, of dry and wet, to give it proper economical food, and not to lose sight of it till the red shoots.

Turkeys should be allowed to enjoy themselves freely in the open air; as soon as the red begins to shoot, the young turkey manifests a desire to perch in the open air. Open sheds, when they can be made secure against intrusion of enemies, are best suited to them. By placing the bars on which they roost several feet above the surface of the ground, the air that surrounds them is constantly renewed. They require roomy habitations, in order to preserve them from the effects of their own infection. The place in which they are kept should not only be well ventilated, but occasionally fumigated. They cannot endure confinement even for a night in a filthy hen-house.

The scorching sun and rain are, above all, hurtful to young turkeys, and it must be an indispensable care to shelter them from the one and the other, at least during the first six weeks or two months, which is about the time the weak stage lasts.

Fattening turkeys is an easy process; at the commencement of cold weather, when they are generally about six months old, they are to receive better and more plentiful food, in order to increase their size and plumpness expeditiously. For this purpose their appetite must be well supplied, and the common diet will answer; but if they have not one sufficiently keen, they should be confined to the farm-yard. The following preparation may be given to them every morning for a month or six weeks. Boiled potatoes, mashed, and mixed with corn, buckwheat or barley meal, according to local resources, made into a paste or mush, and of which they may eat as much as they can. Every evening the remains of the paste must be carefully removed, and the vessel in which it had been put in the morning, thoroughly cleansed. The food of this bird must be kept clean, and the utmost care taken *not* to give them on the morrow the remains of the paste of the preceding day.

The turkey is not a hardy animal, and is subject to diseases which may be avoided by proper treatment. Sometimes the plumage bristles up all over the body, and they have a languishing aspect; on examining the feathers of the rump attentively, two or three will be found whose quill part is filled with blood; remove these and the poor turkey is soon restored to health and strength.

The Pintado or Guinea-fowl, *Numida Meleagris*, is a native of Africa, where it is found in vast flocks; but it is now diffused over every part of Europe, the West-India Islands, and a great part of America. The pintado is a restless, noisy bird; the female lays numerous eggs, which are smaller than those of the common hen, but esteemed much more delicate; like other gallinaceous birds, she is apt to secrete her eggs until she has produced her brood.

The pintado is an agreeable variety in the poultry-yards, liked by some for its flesh, and by all for the delicacy of its eggs; but it is of little economical importance. The chicks are very tender, and should not be produced too early in spring. They are generally hatched by the common hen, who either covers a large number of them, or is found to be a more careful nurse than the pintado herself. The method of rearing and feeding is similar to that of the common or domestic fowl.

The Peacock, *Pavo cristatus*, need scarcely be mentioned as a bird of economical use. Pea-hens and pea-chicks, indeed, are occasionally used for food, but this splendid creature is, and ought to be, regarded solely as an object of beauty. The advantages to be derived from rearing it for food are not to be thought of. They are a native of India.

The Common Pigeon, *Columba livia*, is a race of birds multiplied throughout the warmer and temperate regions; but it is in the warmer regions that they attain to their greatest size and beauty of plumage. They have been in all ages the favourites of mankind, to which their innocence and beauty seem to give them a peculiar claim. But if it be as farmers that we are to regard the pigeon, the beautiful favourite, unfortunately, cannot attract much of our regard. Nothing beyond the gratification of luxury can be derived from the cultivation of the domestic pigeon for food. In vain has it been asserted that pigeons do not feed upon green grain, cannot dig into the earth with their bills, do little harm to the cultivated crops, and consume only the seeds of injurious plants. The experience of farmers shows that the damage done by these creatures to our various crops of wheat, peas, and beans, is very great; and certainly the waste is in no degree compensated for by the quantity which the animals afford of human food.

Yet, as pigeons are in demand as objects of consumption, and as they afford a luxury and convenience to those who live in the country, the subject of their management is, like every branch of husbandry, deserving of attention. If pigeon-houses are to exist at all, those who possess them should know how they are to be best managed, so that the largest return may be derived from them. Though there is scarce any branch of the management of the domestic fowls more misunderstood, yet the essential rule of management is simple. Its principle consists in regular feeding, in giving sufficient space to the birds, and in paying a strict attention to cleanliness.

The next in order of the domestic fowls are the Web-footed. These birds, when domesticated, become enlarged in their form, and wholly the creatures of their new condition, though they still remain partial to an aquatic situation, swimming with facility, and feeding on fish, insects, and the leaves and grains of aquatic plants. They are hardy, easily propagated and fed, and afford a rich and savoury food.

1. The Wild Duck or Mallard, *Anas boschas*, is the original of the common domestic species. It is widely diffused over the world, inhabiting America, Europe, and Asia. These birds live in the marshes, lakes, and rivers of the North in incredible multitudes. In autumn, they migrate southwards in numerous bodies, the greater part returning in spring to their former haunts, though large flocks and scattered pairs remain and breed in the morasses and rivers of lower latitudes.

The wild duck in its natural state is a wonderfully shy and cautious creature. It breeds once in the year, the pairing time commencing about the end of February, and each couple living apart amongst the reeds of lakes, rivers, and marshes, where they breed. Nothing can be more tender than the care of their offspring by these birds. The nest is formed on the ground, generally in a tuft of reeds or rushes, bent into form, and lined with the down of the parents. The incubation lasts 30 days; when the female quits her charge for food, she covers up the eggs, the male in the mean time keeping watch near the nest; and when she returns, she approaches cautiously, winding that she may avoid discovery. The young burst their shells nearly at one time, and in a few hours the parents conduct them to the stream, where they at once begin to swim, and feed on herbs and insects; and at night they are gathered together under the wings of the dam. In three months they can fly; and in three months more their growth and plumage are complete.

The domestic duck adapts his habits to his new condition. He no longer retires with one female to pair, and tend his brood, but becomes polygamous; and he loses the caution and sense of danger which distinguish him in his wild state. Still, as in the wild state, by means of his nicely-formed bill, he finds in marshes and elsewhere the food that is suited to him. He feeds alike upon animal and vegetable substances; on the spawn of fish, and the larvæ of insects; upon grass, the seeds of aquatic plants, and even sea-weeds. These birds may be said to be omnivorous, and this it is which, with their hardy qualities, renders them so easy of culture.

The duck begins to lay her eggs in February, and, obeying her natural instinct, she will, unless confined, lay them abroad, and conceal them. During the period of hatching, she requires no other care but to be kept undisturbed. When she wants food, she will go in search of it, covering up her eggs as in the wild state. When the young are hatched, they should be allowed to remain in the nest so long as the dam chooses; after which she may be put into a coop in the open air during the day for a short time. She should then have a full allowance of good food and water, while the young should likewise have a flat dish put down to them with water frequently renewed, with a proper supply of meal or other farinaceous food, such as boiled potatoes.

A common hen is frequently substituted for the natural parent to hatch the eggs of the duck. But wherever there are any pools of water, the proper nurse is the duck herself; she conducts her young to their natural element, and brings them from it when it is time, while, when a hen is the nurse; they disregard her signals on the bank, and do not themselves know when to return.

The feeding of these fowls is easy. In certain situations, they are allowed access to their natural haunts, the marshes and the bogs, where they feed; and when they are to be ultimately fattened, they are fed for a short time on farinaceous food. As in the case of other fowls, there are also breeds of the common duck more or less valued; and there are some singular varieties, as the hook-billed duck, reared in aviaries and poultry-yards.

The Mallard is the original of the ducks usually reared for economical purposes. Other species, too, are sometimes domesticated. One of these is the Chinese duck, *Anas galericulata*. A large species is the Muscovy duck, or, as he ought rather to be called, the Musk duck, *Anas moschata*, a native of Paraguay, and the neighbouring provinces. He there perches on trees by the sides of rivers and marshes, and breeds several times in the year; he is very shy in his wild state, but readily submits to domestication; he is larger than the common species, very prolific, and easily fattened.

2. The Wild Goose, *Anas anser*, a native of America, is another of this valuable family, widely extended over the world, and susceptible of entire subjection to the will of man.

Like the wild duck, this fine animal quits the swamps of the vast wildernesses of the North on the approach of winter, and migrates far to the South. From 50 to 100 individuals are often in flight together, at a vast height, sometimes beyond the reach of vision, and only recognised by their shrill voices. All have witnessed the surprising regularity of their flight; the leaders forming the apex of an angle, and cleaving the air, as it were, for those that follow. They pursue their lofty flights from vast distances, and when they alight for food or rest, they station sentinels, to guard them from surprise.

Part of them remain to breed in the lakes, rivers, and fens of lower latitudes, but the greater number of them return to the boundless regions of marsh and forest whence they had taken their flight, and where they can rear their young in security.

The domestic race of this species generally loses the desire of escaping, although a few instances occur of the tame joining the wild race. The tame variety is reared in every civilized country. Its habits render it an easily cultivated animal, and it is an object of great economical importance in the districts of fens and marshes, which are the most suited to the rearing of it.

The period of incubation is from 27 to 30 days, and the female covers conveniently from 11 to 15 eggs. She manifests the period by carrying straw in her mouth, and then a nest should be prepared for her in a secure situation. During the time of hatching, the male stands a watchful sentinel, and will fiercely attack the largest animals that approach the nest.

After the young are brought from the nest, the dam may be penned with them on a spot of dry grass, while farinaceous food, water, and any wholesome green herbs, must be supplied. After a short time, the dam and her brood should be allowed to forage for themselves in the fields and marshes. They are perfectly herbivorous, and will graze like sheep. Those who are favourably situated with respect to the means of rearing these fowls, seldom give them any more attention, than to drive the broods, with the dams, to the contiguous fens or marshes where they feed.

In situations less favourable, more attention must be paid to the feeding of them. They must be well supplied with food like other fowls, but it constitutes the particular facility of rearing these animals, that not only farinaceous substances, but every kind of edible herbs, as turnips, potatoes, the refuse of the garden, and the like, may be given to them. They may be soiled, too, on clover and tares; and when being fattened, steamed potatoes, meal mixed with milk, and the like, may be given to them.

The young are either disposed of at a month or 6 weeks old, when they are termed green-geese, or they are retained till after harvest, and fed upon the stubbles, when they are termed stubble-geese. If they shall not be sufficiently fattened on the stubbles, they must be put up to feed, all that is necessary in this case being, to give them plenty of water and constant food, and to litter them carefully with straw.

Besides the produce in flesh, there are derived from this animal down and feathers, both those of the wings, which are made into writing-quills, and those of the body, which are applied to different uses. This has given rise to the dreadful barbarity of plucking the animals, which is sometimes done five times in the year.

3. The Domestic Swan, *Anas olor*, has in this country ceased to be regarded as food, and is now preserved solely for the beauty and majesty of his form, with respect to which he is the noblest of all the water-fowls. He feeds like the goose, but is more aquatic in his habits. He is gentle and familiar to his keepers, eating his food from the hand; but while engaged in the rearing of his brood, he is fierce and dangerous to be approached. He is a bird of great courage, but is never the assailant of others.

It is stated on the authority of the Maine Farmer, that geese may be fattened on turnips with very little trouble or expense. The turnips are cut in small pieces resembling dice, but smaller, and placed in a trough of water. An experiment was made, and it was found that with this food alone, six geese, each of which when lean weighing nine pounds, actually gained twenty pounds each in three weeks fattening. Malt is an excellent food for geese.

VII. BEES—THEIR MANAGEMENT, &c.

THE common honey bee, the *Apis mellifica* of LINN. is cultivated in every civilized country. The bee is an interesting subject to the lover of natural history; while at the same time it deserves the most careful attention of the farmer, as one of those means within his reach of contributing greatly to his domestic comforts, and increasing his annual profits with very little care. The culture of bees has been neglected in many sections, because their proper mode of management was not understood. There is no general rule, applicable to all cases, as the treatment varies in almost every district, and the most successful apiarians. As we regard the culture of this industrious insect as highly important to the comfort as well as the pecuniary interests of the community, we give below, from the best authorities, such information as may enable the young beginner especially to conduct his operations to a successful and profitable issue.

A hive of bees may be considered as a populous city, containing from fifteen to eighteen thousand inhabitants. This city is in itself a republic, where well ordered industry and perfect equality reigns. The combs are composed of pure wax, serving as a magazine for their stores, and a place to nourish their young. Between the combs there is a space sufficient for two bees to march abreast; and there are also transverse defiles, by which the bees can more easily pass from one comb to another.

According to COLUMELLA,* an *Apiary* should face the south, in a situation neither too hot nor too cold. It should stand in a valley, that the bees may with greater ease descend, on their return to the hive; and near the mansion-house, and situated at a distance from noise and offensive smells; and in the vicinity of a brook or river. Where the bees cannot have the benefit of running water, they ought to be supplied with it in a trough provided with small stones, on which they may stand while they drink. They cannot produce either combs, honey, or food for their maggots, without water; but the neighbourhood of rivers or canals with high banks, ought to be avoided, lest the bees should be precipitated into the water by high winds, and consequently perish. The garden in which the apiary stands, should be supplied with melliferous plants and branchy shrubs, that the swarms which settle on them may be the more easily hived. Particular attention should be paid to the circumstance, that the bees be hived in a neighbourhood productive of such plants as supply them with food; such as thyme, the oak, the pine, fruit-trees, furze, broom, mustard, clover, heath, &c. PLINY recommends broom, as a plant particularly grateful and profitable to bees.

It is well known that bees, when properly cultivated, produce considerable profit, and in order to obtain the greatest possible advantage, it is necessary to supply them with every convenience for the support of themselves and their young. We should also contrive means to take the wax and honey with the smallest possible loss. In short, when the apiary is placed in a good situation, (either south or south-west,) that is, in a country abounding with flowers, at a distance from brew-houses, smelting works, &c. the next and most important point, is the choice of well constructed hives.

The old practice, and one which obtains to a very considerable extent even to this day, in almost every country, was to construct the hives out of straw. They were generally ill-contrived—and almost, if not quite, impossible to remove either the wax or honey without destroying the bees, a practice as barbarous as it is unnecessary. Nothing we conceive can be more cruel and revolting to the feelings of true humanity,

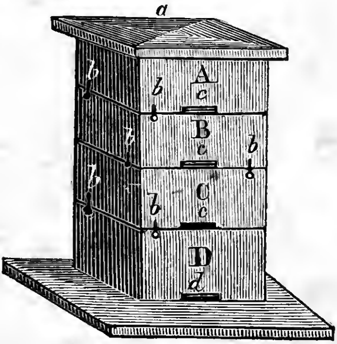
* Who wrote in the time of our Saviour.

than the destruction of these industrious and inoffensive little creatures, in order for man to obtain the fruits of their industry and toil.

Reflecting on these circumstances, M. Harasti, during his cultivation of bees, conceived that it would be possible to form a hive which should have all the advantages of the best kind, while the simplicity and cheapness of its construction, might bring it into use among husbandmen.

A good bee-hive ought to possess the following properties: First, it should be capable of enlargement or contraction, according to the number of the swarm. Secondly, it should admit of being opened without disturbing the bees, either for the purpose of cleaning it; of freeing it from insects; of increasing or dividing the swarm; or for the admission of a stock of provisions for the winter. Thirdly, it should be so constructed, that the produce may be removed without injury to the bees. Fourthly, it should be internally clean, smooth, and free from flaws. All these properties unite in the hive here described.

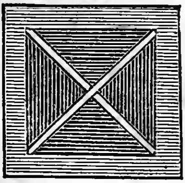
It is formed of four open square boxes, A, B, C, D, as represented by the following cut:



These boxes are fastened to each other by several wooden buttons, *b*, *b*, &c. which turn upon a rod or screw. The whole is covered with a moveable roof, which projects over the boxes slanting from the centre *a*, that the rain-water may run off. It is necessary to place a stone on the top of the roof, to keep it on firm.

Instead of buttons, the boxes may be combined by a rabbet fastened with wooden pegs; but in either case, the conjoined parts should be closed with cement. If the swarm is not very numerous, three, or even two, boxes will be sufficient. Each of them should be about three inches, or three inches and a half in height, and about six inches in the clear within. They should be made of wood, at least three quarters of an inch thick, that the bees, wax, &c. may be less affected by changes in the temperature of the atmosphere.

Within the boxes, at the upper part, there should be fixed two bars, in the form of a cross, with the extremities extending to the angles of the box, as is represented in the following figure.

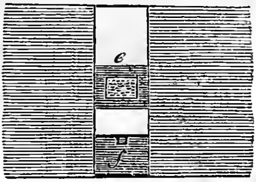


To these bars the bees attach their combs. At the lower part of each box, in front, there must be an aperture or door, as at *c*, *c*, *c*, *d*, as high as is necessary for the bees to pass conveniently, and about an inch and a half wide; of these apertures, only the lowest (marked *d*,) is to be left open for the passage of the bees; the others are to be closed by means of a piece of wood, properly fitted to them.

It must be evident that this bee-hive has all the advantages before mentioned. To lessen or enlarge it, only requires a diminution or increase of a number of the boxes; and a communication with the internal part can easily be effected by the removal of the cover.

The cheapness and facility of the construction of this hive is evident, as nothing is requisite but to join four boards with nails, or in any other manner, so simple that it may be done by a day-labourer.

When the hives are made, they should be placed in a good situation: the best is south-west; but they must not be too much exposed to the heat of noon, which may be mitigated, by placing the branches of trees to shade the hives, as violent heat is injurious, not only to the bees, but to the wax and honey. The country around the apiary should be of a sandy soil, abounding with plants and shrubs. As bees love cleanliness and quiet, the circumjacent space should be kept clean, and free from offensive smells and noise: smoke is particularly disagreeable to them. The boards or table on which the hives are placed, should be dry, clean, and sound; and the hives ought to be sufficiently raised to prevent their exposure to dampness and insects; they should also be kept at a distance from a wall, to avoid the reflected heat of the sun. In the table on which the hives are to stand, there should be an aperture, under each, about two inches square, as it is represented at *e*, in the following cut:



This aperture should be covered with a piece of tin, drilled full of small holes, so as to afford a free passage to the air, and at the same time prevent the ingress of insects. That this may not occasion any inconvenience to the bees in cold and damp weather, there must be a sliding piece of wood, *f*, under the tin, by which the hole may be completely covered.

When it is intended to introduce a swarm of bees into a new hive, it must be thoroughly cleaned, and the inside rubbed with virgin wax. It is advantageous to place a piece of clean honey-comb, about nine inches long, in the hive, and care should also be taken to choose that which is made of very white wax. This piece being supported by a stick passed through it, offers to the bees a kind of nest, and excites them to continue their work.

The new hive being thus prepared, the manner of introducing the bees into it, from an old hive, is as follows: the latter must be placed upon one of the boxes of the new one; but as it will seldom happen that they are of the same size, and exactly fit each other, a board, at least as wide as the largest of the two hives, and which has a hole equal in size to the smallest, must be placed between them, and completely joined with cement, or by any other means, in such a manner as to be quite close, and to leave the bees no passage except into the new hive. As these insects generally work downwards, they will soon get into the new hive; and, when it is occupied by about one-half of the swarm, some holes must be made in the top of the old hive, and kept covered, till the proper time for making use of them.

Every thing being disposed as above directed, we must take the opportunity of a fine morning (but not a very hot one), about eight or nine o'clock, at which time most of the bees are generally out of the hive, gathering their harvest. The comb is to be cut through, by means of a piece of iron wire, and the old hive, with the board on which it stands, is to be separated from the new one. An assistant must immediately place the cover (already well fitted) upon the top of the new hive. The old hive is then to be taken away, to the distance of thirty or forty paces, and to be there placed upon two chairs, or other supports, in such a manner as to be quite firm; but leaving a free space, both above and below, for the following purpose.

Upon this old hive (the holes at the top of it being first opened) is to be placed one of the boxes of the new hive, having the cover loosely fastened on it, so that it can easily be removed; this box must be fixed upon the old hive, in such a manner (by closing the intervals between them with linen cloths, &c.) that the bees, upon going out by the holes in the top of the old hive, can only go into the new one. In order to drive them into it, some live coals must be placed under the old hive, upon which a few linen rags may be thrown, to produce a great volume of smoke. As the smoke rises, the bees, being incommoded by it, will ascend to the top of the old hive, and at length will go through the holes into the new one. When all the bees, or nearly all, are gone into it, (which may be known by looking in at the little door, or by their noise,) it is to be removed gently from the old hive, and placed under the box already alluded to, the top or cover being previously taken off. The next morning, if it should appear that the two boxes, of which the new hive is now composed, do not afford sufficient space for the bees, a third box may be added, under the others; and after that a fourth, if necessary, as their work goes on, changing them from time to time, so long as the season permits the bees to gather wax and honey.

In performing the operations here described, it will be necessary to defend the hands and face from the stings of the bees. The best way of doing this, is to cover the whole of the head, neck, &c. (over a hat) with coarse cloth, or canvass, which may be brought as low as the waistcoat, and fastened to it: through this cloth we may see the operations of the bees, without fearing their stings. The hands may be protected by means of gloves, of which the best are those made of wool.

When we mean to bring a new swarm into a hive, that prepared as above, and formed of two, three, or four boxes, according to the size of the swarm, must be brought near the place where the swarm is. The upper box, with the cover fastened on (but so that it may easily be removed,) must be taken from the others. The cross bars, before described, should be smeared with honey, diluted with a little water; the small door must be shut; and the box must be turned upside down, and brought under the swarm, which is then to be introduced, in the same way, and with similar precaution, as into a common hive. When the whole swarm is in the box, it is to be carried to the other boxes (previously placed in the destined situation), and, turning it very carefully, is to be put upon them. The buttons are then to be turned, the interstices closed with the cement already described, and all the little doors closed, except the lowest, through which the bees are to pass. Nothing is more disagreeable to a fresh swarm than a hot sun, for which reason, that the bees may not wish to leave their new habitation, it will be right to shade the hive for some days.

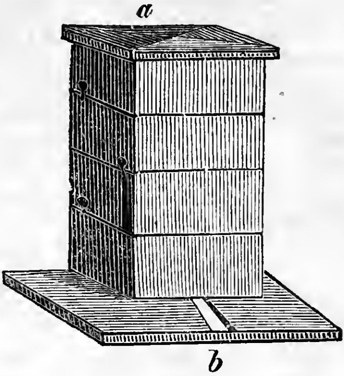
A hive made in the manner here pointed out, appears to me to be such as would be most useful to husbandmen in general, who wish to cultivate bees; but a hive may be made upon the same principles, which will shew the work of the bees, through its whole progress, and thereby enable any one to study the natural history of these wonderful insects.

A hive of this kind is composed of three or four boxes, with a cover, like the hive already described; it may also be of the same form and size. But in every box, on that side which is opposite the little door, there must be fixed a pane of glass, with a sliding shutter over it, so that by drawing back these sliders, the inside of the hive will be exposed to view. To see the bees at work, however, it is necessary that the comb should be disposed in a regular manner, and perpendicular to the pane of glass. This may be obtained, by placing in the boxes, instead of the two cross-sticks already described, on p. 418, five parallel sticks or bars, as represented in the following figure.

The bees will attach their combs to these bars, and the intermediate space will afford sufficient light for seeing them work. If more light is desired, it may be obtained by opening the little doors opposite the glass; which doors may be made considerably higher than is above directed, and may have a slider over them, by which their aperture may be diminished at pleasure.

The sliders which cover the panes of glass, ought never to be opened, except for the purpose of observing the bees; because a strong light lessens their disposition to work. If it should be perceived that the coldness of the glass is prejudicial to the bees in winter, it may then be covered with a cotton cloth; or it may be entirely taken away, and a piece of paste-board put in its place; for at that time, the operations of the bees are suspended.

Instead of making a little door to each box, to be left open when the box is lowermost, for the passage of the bees, perhaps it might be better (because more simple) to cut a groove in the board or table on which the hive is placed. This groove should be about two inches wide, and about three-fourths of an inch high at the outer edge, and should be gradually diminished, both in width and height, towards the part where it meets the hive, as is represented at *b*, in the following figure.



Two advantages are derived from this construction. First, the little door in the box, and the contrivance for opening and shutting it, will be unnecessary. Secondly, it is sometimes proper to diminish or enlarge the opening for the passage of the bees, according to circumstances, without shutting it entirely, and this may be done with the greatest ease, by moving the hive nearer to, or farther from, the edge of the table; or this passage may be entirely closed, by moving the front of the hive beyond the groove; but in that case some small holes must be made in the hive to let in air, which may be stopped up when that formed by the groove is open.

A farther advantage attending this construction is, that as the groove will have a slanting direction, the bees will thereby be enabled, with very little trouble, to remove from the hive any dead bees, excrement, &c. which may be obnoxious to their nature.

Whoever intends to erect an apiary, should purchase hives towards the close of the year, when they are cheapest; and such only as are full of combs, and stocked with a sufficient number of bees. In order to ascertain the age of the hives, it should be remarked, that the combs of the last year are white, while those of the former year acquire a darkish yellow. Where the combs are black, the hive should be rejected as too old, and liable to the inroads of vermin.

Bees never swarm till the hive is too much crowded by the young brood. They sometimes begin to swarm in May, or earlier, according to the warmth of the season. As soon as a swarm is settled, the bees should be immediately hived, to prevent their taking wing again. If they settle on a low branch of a tree, it may be cut off and laid on a cloth, the hive being ready for their reception; but if it be difficult to reach them, it will be advisable to let them remain where they have settled till the evening, when there will be less danger of their escaping.

When the swarm is hived, they should be immediately removed to the apiary, but the hive should be kept near the place at which the bees settled, till the evening, lest some stragglers might be lost.

The usual method of uniting swarms, is by spreading a cloth at night upon the ground close to the hive in which the two swarms are to be placed. Lay a stick across the cloth, on which place the hive with the new swarm: on giving a smart stroke on the top of the hive, all the bees will drop in a cluster upon the cloth. Then take another hive from the stool, and place it over the bees, when they will ascend into it, and mix with those already there. Another method is, to invert the hive in which the united swarms are to live, and strike the bees of the other hives into it, in the manner before described.

A large swarm weighs eight pounds, and others gradually less, to one pound. Hence a good swarm should weigh five or six pounds. Such as are less than four pounds weight, should be strengthened by a small additional swarm. The size of the hive ought to be proportionate to the number of the bees, and it should be rather too small than too large, as these insects require to be kept warmer than a large hive will admit.

In Britain, it is usual, in taking the honey, to deprive the bees of their lives. The common method is, to suffocate them with the smoke of brimstone; but Mr. Manley has adopted a more humane and judicious plan: he says, "I never destroy the old stock of bees; but after lifting them, to examine what honey there is, if I think the hive is full, I put another under it with a flat top, having a square hole in the centre. When the bees are in the under hive, I place a shutter, which is of wood, in the hole at the top; and that prevents them from going into the upper hive. I then invert it in a bucket, and strike it with a rod till I think they are all out, after which they go into the under hive."

The following observations were published by George Morgan, Esq., formerly of Princeton, New Jersey.

"Several writers on the management of bees, have given very ingenious directions for taking their new made honey, without destroying those useful creatures. My humanity, hurt at the idea of setting fire to the fatal match, induced me to imitate their methods; particularly those of Mr. Wildman, and the Rev. Mr. White, whose directions I observed very attentively, with some success; but my expectations were not gratified, as I found young broods in every hive I took, and consequently the honey obtained was impure. . . . However, after a variety of experiments, I discovered an agreeable, safe, and easy way to take the honey, without the least injury or disturbance of the bees.

As I have experienced great pleasure, and some benefit from my discovery, I take this opportunity to lay it before the Agricultural Society.

My boxes are made, after the manner of Mr. White's, of any well-seasoned wood, ten inches square in the clear; in pairs, with communications at the sides, for the bees to pass freely from one box to another: a pane of glass (7 by 9) with a sliding shutter, may be put into the back part of each box, through which you may see the bees at work. Any person who can handle a saw and hammer, may make the boxes at a small expense.

The communications between the boxes are at top and bottom; those at top should be three inches long, and half an inch wide, to serve as streets or alleys betwixt the hives.

The communications at bottom should be five or six inches long and three fourths of an inch deep, so as to afford a free passage from one hive to the other.

The mouth of the hive may be from three to ten inches long, and half an inch deep. In the busy season, this wide entrance facilitates the bees going out and coming in, and may be contracted at pleasure in autumn.

Early the next morning after hiving a swarm of bees in one of these boxes, I add another to it, the door of which I close until the bees begin to work in it; when I open it to facilitate their industry.

Each box, of the above dimensions, will contain thirty pounds of honey. . . . An early swarm, in a favourable situation and season, will fill two boxes, and cast out several swarms; each of which will fill two boxes with honey.

As winter approaches, all the bees collect themselves into one box, and will leave the other, with its contents, to the use of the owner, whose profit, in good seasons, will be 90 lbs. of honey, and several additional swarms, for every stock kept over the preceding winter. . . . 15 or 20 lbs. of honey are sufficient to keep a stock over our longest winters, but I leave them 30 lbs.

Thus I acquire the purest honey, without the use of the match, or any trouble in dividing or disturbing the bees; for on turning up the hives (which have no glasses) I discover, immediately, that in which the bees are collected, and I carry off the other, without a single bee in it.

The losses and disappointments I have met with in a great variety of experiments, induce me to recommend this management to every lover of bees, as I have found it easy, pleasant, and profitable."

It ought to be observed, that all honey is not wholesome. Bees indiscriminately sip the flowers of all plants abounding with sweets; and as some of these plants are of a poisonous nature, it follows that the honey must partake of their injurious qualities. Dr. Barton has written a very excellent paper on this subject. *Amer. Phil. Trans.* vol. 5th. The plants affording this poisonous honey are, *kalmia angustifolia*, or dwarf laurel; *kalmia latifolia*, or great laurel; *kal. hirsuta*, a pretty little shrub of the southern states; *andromeda mariana*, or broad-leaved moorwort. . . . . As these are very plentiful in many of the American forests, their blossoms afford much honey for the wild bees.

Dr. B. thinks that it will be found that other plants yield unwholesome honey; such are, 1. *Rhododendron maximum*, or Pennsylvania mountain laurel; *azolia nudiflora*, or wild honey suckle; and *datura stramonium*, or Jamestown weed. The four first mentioned plants ought to be extirpated in the neighbourhood of bee-hives; and the honey produced from the three enumerated in the second place as suspicious, should be carefully examined to determine the fact with regard to them.

Job Roberts, Esq., a gentleman long and favourably known, especially to the inhabitants of Pennsylvania as an enlightened practical farmer, says, in his Treatise on Husbandry, published nearly forty years since, that honey may be taken without destroying the bees by putting under the hive another with a flat board on the top and a square hole in the middle for the bees to descend through; there must be a sliding shutter to the hole to shut it, when the bees have descended into the lower one. They will sometimes fill this also, and require a second to be put under. The time for taking, the end of June or beginning of July.

Honey collected from the flowers growing in meadows, pasture lands, trees, and cultivated crops, is almost as limpid as the purest oil, and the wax nearly as white as snow. Collected from buckwheat is harsh. It is collected from what is improperly called honey dew, as well as from flowers. Taken only once in two years, it is richer and more solid, and will keep better than what is taken every year. Bees, when their stores are exhausted, should be fed with honey hard pressed from the comb, which contains bee-bread as well as honey. They cannot be kept alive with pure honey alone. To feed them, cover a plate with thin cut comb, and fill the cells either with honey or coarse sugar, mixed with middle beer—it must not be too thick.

In some years a stock will increase itself sixfold. The bees of one society will attack those of another society, plunder them of their honey, and destroy most of them, perhaps all of them, in battle. The best method of putting a stop to these battles, is to remove the attacked hive to a distant part of the garden.

Since the importance of the bee culture has been made apparent, a variety of plans have been adopted by our ingenious countrymen to raise them successfully, and to take their surplus store of honey without resorting to the cruel practice of depriving them of life. A Mr. Luda, of Connecticut, has invented a contrivance, by means of which bees are made to build their cells and deposit their honey in the chamber of a dwelling house appropriated to the purpose, in neat little drawers, from which it may be taken fresh by the owner, without killing them. A Connecticut paper describes it as follows: "The hive has the appearance of, and is in part, a mahogany bureau or sideboard, with drawers above and a closet below, with glass doors. This case or bureau is designed to be placed in a chamber of the house, or any other suitable building, and connected with the open air or outside of the house by a tube passing through the wall. The bees work and deposit their honey in drawers. When these or any of them are full, or if it is desired to obtain honey, one or more of them may be taken out, the bees allowed to escape into the other part of the hive, and the honey taken away." The glass doors allow the working of the bees to be observed—and it is added that the spaciousness, cleanliness, and the even temperature of the habitations provided for them in this manner, render them the more industrious.

A Kentucky bee-house is thus described by Mr. F. C. Fisher.* It is recommended by competent judges, we are informed, as being highly commendable for its convenience and cheapness. The building is twelve feet long, eight wide, and seven feet high from the floor to the plate or ceiling, (the floor being eighteen inches from the ground,) and consists of four posts, eleven feet six inches long, let in the ground three feet, which is weather-boarded round, and covered in so as to prevent the bees from getting in the house, they being confined in six boxes, three on either side of the house, placed fifteen inches one above another. This drawing (fig. 1) represents one side of the house, viewed from the outside.

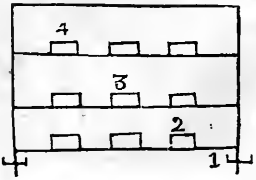


Fig. 1.

Fig. 1, No. 1 1, are copper troughs running round the post, half way between the floor and ground, which are kept filled with water to prevent ants and other insects from getting in the house. No. 2, 3, and 4 are tubes eight inches wide, one-eighth of an inch deep, to convey the bees through the wall into the long boxes, and entering them at the bottom, there being three to each

* Farmer's Cabinet, June 15, 1839.

long box. The drawing, fig. 2, represents one side of the house, viewed from the inside. No. 1, 2 and 3 are long boxes, eighteen inches wide and twelve deep, extending the whole length of the house, with eight holes, four inches square, in each box, upon which is set two gallon caps, with two half inch holes in each, one near the top, the other about the centre of the cap, in which the smoke of a burning rag is blown to drive the bees from the cap into the long box, which can be known by striking the caps. When they are all in the long box, a knife or wire should be drawn under the bottom of the cap to separate the comb from the box, when the cap of honey may be removed, and an empty one put in its place. No. 4 and 5 are tubes three inches square, to convey the bees from one box to another, that one swarm of bees may do the whole, or if one or more swarms be put in each box, that they may become as one, as they will not permit more than one king when put together, by which they are prevented from destroying themselves by fighting. A house of this description, when the long boxes are filled, will afford, at a moderate calculation, ninety-six gallons of honey in the comb annually.

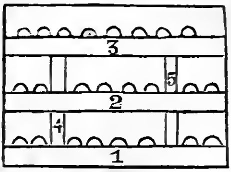
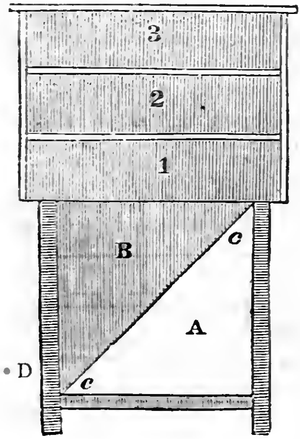


Fig. 2.

A hive combining many advantages was invented a few years since by Mr. William Groves, of Cleaveland, Ohio, which we understand is in general use south and west of the Blue Ridge. We have not seen it, and therefore cannot speak of it from our personal knowledge, but we understand that it is so constructed that from it bees never swarm, and are enabled to reject and roll off all offensive matters, and thus they can always defend themselves successfully against all intruding insects. It is said to be superior to any other for the preservation of the bees. The honey may be removed, in any desirable quantity, at pleasure, without disturbing the bees; and it is always clean and fresh. The colony is not likely to contract disease, as the hive is at all times well ventilated. The inventor has given it a pompous name,* from which circumstance, we should hesitate to notice it were we not assured that it is an excellent article.



The following description of an improved hive was furnished by a correspondent of the Farmer's Cabinet, residing in western Pennsylvania. After some preliminary observations, he says, "I have seen none that, in my opinion, embraces so many advantages as the one here presented. A is a stand, the legs of which are 16 inches high, the stand itself 18 inches square. B represents a three cornered box, open on the top; with a slanting bottom c c; a space is to be left open in the front of the hive the whole length at D, to admit the bees and allow the dirt to slide off the slanting bottom.

1, 2, and 3, are boxes on hives, 19 inches square and 7 inches high, with slats nailed across, a sufficient distance from each other to admit the free passage of the bees; bars are to be put across the hive to support the comb. The top to be secured by a tight cover. The bees enter at D, and pass up the slanting bottom of the stand into the boxes above, and the

* "Patent Fortified Transparent Royal Bee Palace!!!"

boxes can be increased by adding others, always placing the additional boxes nearest the stand.

This hive possesses the following advantages over the hives in common use:

I. *It prevents the ravages of the miller*, whose worm is the bee's most fatal enemy. The miller deposits its eggs in the bee dirt; which in the common hive is constantly accumulating on the bottom. This difficulty is obviated by the slanting bottom of the stand; the dirt falling on this rolls out at D, and the bottom is kept clean.

II. *The cruel practice of destroying the bees* is entirely superseded by the use of this hive. By blowing a small quantity of tobacco smoke into the upper box, through a hole made for that purpose, the bees will descend into the box next below; the upper box can be removed; fifty or sixty pounds of honey, entirely free from dead bees and dirt, can thus be taken from a good hive; and enough remain to winter the bees without any risk of loss.

III. *The swarming of the bees can be regulated* by the rise of this hive, and the new swarms taken at the season of the year when they are most valuable. The bees can be prevented swarming again for the season, by additional boxes as the young bees increase.

IV. *This hive is cheap* and requires but little mechanical knowledge in its construction; any farmer with ordinary tools can make it from the above description.

The feeding of bees is generally deferred until winter or spring. This is very wrong—a more erroneous practice cannot be pursued. Hives should be examined towards the close of September, and the utmost attention paid to securing these little animals with a sufficiency of provender during the winter. A full supply should always be left them, for without an abundance of food during the months they are affected by cold, they are very liable to perish. All hives should be weighed, and the weight marked on them before the bees are hived in them. Thus, by weighing a stock as soon as frost has killed the blossoms in the fall, the apiarian will be enabled to form a just estimate of their necessities. When bees are fed in the fall they will carry up and deposite their food in such a manner as will be convenient for them in the winter.

The diseases to which the bee is subject are few and unimportant, if they are regularly and properly attended to. They are excessively annoyed at times by insects, the principal of which is the bee-moth, a native of Europe, which has strangely found its way into this country and become naturalized among us. It is a vile pest—a deadly enemy to the bee, and if not closely watched and carefully destroyed by the hand of man, the hive will perish. No certain means of arresting his ravages have as yet been discovered. When first appearing they resemble a white worm or maggot, with a reddish crusted head; size various—the largest about the size of the barrel of a turkey quill; sixteen short legs tapering each way from the centre of their bodies. They wind themselves, like the silk-worm, into a cocoon, and pass the dormant or *chrysalis* state of their existence, and in a few days come out of their silken cases perfect winged insects or millers, and are soon ready to deposite their eggs, from which another crop will be raised.* It is thus seen that the miller enters the hive, deposits her eggs, in due time they hatch, a moth is produced, and the race of destroyers perpetuated.†

The method now generally recommended, as having been found best adapted to prevent the ravages of the moth, is simply to raise the hive by placing under it small blocks at each corner, by which means the bees have free egress and ingress throughout the moth season. The bees should be carefully examined every day throughout the season, and the worms or maggots of the moth destroyed, which can be done in the morning without disturbing the bees—unless they have been neglected too long; the worms will be found almost invariably collected near or under the edges of the hive. Care must be taken not to raise it so high as to admit the entrance of mice.

Bees-wax, a solid concrete, obtained from the honey-combs, after the sweet and liquid parts are extracted, by heating and pressing them between iron plates. The best sort should be hard, compact, of a clear yellow colour, and an agreeable odour, similar to that of honey. Pure bees-wax, when new, is tough, yet easily broken: by long keeping, it becomes harder and more brittle, loses its fine colour, and partly also its fragrance. The purposes to which bees-wax is applied, are various: great quantities of it are annually bleached, and converted into candles. On account of its softening and healing nature, it is much used in cerates, plasters and ointments.

Stings of bees are more virulent than even those of wasps, and sometimes attended with very violent effects. As the sting is barbed, it is always left in the wound. When, therefore, a person is stung by a bee, the sting should be instantly extracted; for, by its peculiar form, it will penetrate progressively deeper into the wound, and communicate more of its poison, according to the time it is suffered to remain. It should be carefully pulled out with a steady hand; for if any part of it breaks in, remedies will in a great measure be ineffectual. When the sting is completely extracted, the wounded part should be sucked; and little, if any, inflammation will ensue. If a few drops of spirit of hartshorn be immediately rubbed on the part affected, the cure will be more speedily accomplished. This spirit, however, acts only as a stimulating antispasmodic, enabling the vessels to overcome the spasm formed on the extremities. An application of Goulard-water, or a cold saturnine poultice, would produce a similar effect.

Another simple remedy, equally efficacious and expeditious, is a solution of indigo in water; speedily applied to the injured part.

Honey and olive oil may also be occasionally substituted with advantage; but their application should be repeated till the pain ceases.

For treating the stings of these insects, common salt is almost a certain and almost instantaneous cure; if the sting be internal the salt must be swallowed; in the contrary case, the skin should be previously moistened, in order that it may more easily absorb the saline matter.

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* Weeks's Manual.

† At an early stage of their existence, while yet a small worm, they spin a web, and construct a silken shroud or fortress, in which they envelope themselves, and form a sort of path or gallery, as they pass onward in their devastating march—at the same time being perfectly secure from the bees, in their silken case, which they widen as they grow larger, with an opening in their front only, near their head, they commit the greatest devastation on the eggs and young bees, and all that come in their way.

SILK AND MULBERRIES.

On this subject we have little to say; when the immense excitement which has seized upon our fellow citizens in every portion of the union shall have passed away, something may be said definitely upon it. It does not strike us favourably at the present writing—there is too much of mania—too much wild speculation, to determine the merits of the question *now*. That many sections of our country are adapted to the growing of silk, is an undeniable truth; and we fully believe that, eventually, when the matter is better understood—when it has become purified of the taint of speculation, that it will come up on a sure and firm basis. But time and experience are necessary. We do not speak this by way of discouragement. We desire to put our brother farmers on their guard against loss, and not desert their legitimate calling for the *morus* or any other new device, with which men, in their haste to get rich, have filled the public mind to bewilderment. If they must engage in such speculations, we bid them be cautious—to manifest the same care they do in trying agricultural experiments. The farmer is so situated that he can test a thing of this kind without running headlong into the ditch. We advise them to go on the small and *safe* scale, and not on the large.

The following article on this, at present interesting topic, was penned by one of our most discerning, intelligent and patriotic farmers, who has just paid the debt of nature; and in whose death the community at large, and the agricultural portion particularly, have sustained a severe loss.

We have promised to give directions for the culture of the mulberry, and the management of the silk-worm—and we shall now proceed to redeem our promise. In the meantime we will recommend, that every person who designs seriously to enter into the business, should either purchase one of the half dollar publications which have recently come from the press, or subscribe for one of the dollar periodicals, which are specially devoted to this business. Either of these will afford all the instructions, in a compact and handy form, necessary for the perfect management of the business. *We* shall be obliged to be somewhat brief; for were we to publish all that is written upon this subject, it would engross our whole paper.

We will remark in the outset, that we do not doubt but the silk business will succeed in our country, and that it will ultimately become a matter of great national concern. Yet we believe that many who embark in it will fail to realize their golden dreams; and that when the fever has passed its crisis, it will be found to depend for success, like every other money making undertaking, upon the knowledge, prudence and economy with which it is managed. We are an enthusiastic, and often an inconsiderate and fickle people. When the fever of public feeling is excited upon any great subject, be it turnpikes, banks, canals, rail-roads, or the culture of silk, we are apt, for want of prudence and forethought, to permit it to assume a dangerous type, that baffles the counsels of reason, and sometimes terminates in extreme lassitude and prostration of strength. Local rivalship and private interest, the spirit of speculation, and the aggrandizement of party, are so profusely employed to stimulate the patient, and to deaden him to a sense of danger, that it is a long time, after they cease to operate, before he is restored to a sane state of mind, and a sound healthy condition of body. And though he does apparently recover from the shock, we have serious fears, that these repeated attacks are imperceptibly undermining his constitution. We have seen the turnpike bubble burst.—Few of these roads are at this day productive—many have been abandoned—much money has been expended upon them—and still the public is not greatly benefitted,—for in general they are not enough better than common roads to make up for the tolls they exact. Had the number been limited to one-third, or one-fourth, and these well made, the interests both of the stockholders and of the public would have been much better subserved than they now are. They have besides led to the culpable neglect of our public roads. We have seen that several of our banks have turned out to be mere bubbles;—and, if we mistake not, some of our canals, and many of our projected rail-roads will in the end prove to be not much better—public sacrifices at the shrine of private gain. We profess to be the ardent friends to public improvements of every sort; but we insist that prudence, which is wisdom applied to practice, is as commendable, and as necessary, and as much a virtue, in the management of the public concerns, as it is in the management of one's private concerns. What individual has ever been renowned for his wisdom or for his justice, who lavished upon one or two favourites, the patrimony which belonged equally to his whole family,—or who, *to benefit his children*, has encumbered his farm with an enormous debt. We would neither creep nor run, if we meant to make haste in a long journey.

No sooner has the silk business become a theme of public favour, than we see capitalists, or speculators, clubbing their means, and already erecting large silk establishments, as they have an undoubted right to do, but in too many cases we fear, from a hope of getting a profit on the *stock*, rather than on the *business*—on their *cunning*, rather than on their *labour*. They should remember, that the first requisite in cooking fish, is to *catch them*. Children sometimes recreate themselves with a play called "*Robin's alive*"—and this seems now to have become a fashionable game with men—though many a "burnt child," we apprehend, will have cause, hereafter, to *dread the fire*.

But we will go back to our starting point, from which we have been inadvertently drawn.

The silk business may be safely undertaken by every farmer who has a family of females, or children, *willing to pick the mulberry leaves and take care of the worms*,—or, if he begins with seedling plants in the nursery, *who has this aid in prospect*,—and he may enlarge his scale of operations, as his prospects of help and profit increase. His outlay will be comparatively trifling. An ounce of mulberry seed, or a few hundred plants, and some eggs when his trees afford leaves, will constitute the principal expense. The money which he obtains for his cocoons, or his silk, will be so much added to his nett income. But if the business is to be managed by hired labour, or without the supervision of the master or mistress, we cannot guarantee success, at least not to the extent that many sanguinely anticipate; and we should by all means advise such as thus intend, to begin with moderation, and to satisfy themselves, from experience, that they can manage the business with profit, before they venture to embark in it to a large extent.

We ought in candour to state two other facts, one of which we have not seen published, and which may be doubted by many till they have it confirmed by their experience. One fact is, that even the common white mulberry is often seriously injured, and sometimes killed, by the severity of our northern winters. The other is, that the Chinese mulberry, or morus multicaulis, seldom escapes injury from a like cause. We have had the white mulberry in our nursery the last six winters. In five of these the frost has killed many of the branches and some of the roots. We have had the Chinese three winters, and three winters the plants have been killed to the ground, and some of them have been destroyed root and branch. Others, we know, have succeeded better. Our soil is light, and we are aware that tender plants suffer more in it, from cold, than they do in clay or loamy soils.

Having made these preliminary remarks, from a wish to present the reader with a view of the whole ground, we proceed in our task to speak of the

Mulberry, to plant and nurture which is the first step in the business. There are several species and varieties of this tree, the leaves of which the worm converts into silk. Our correspondents advise us, that there are three kinds of indigenous growth in Ulster, and two in Montgomery, near the Mohawk river. The red fruited, (*rúbra*,) is found wild in many parts of the country, and the leaves have been employed in feeding the worm. This species is common in most of the states, and a correspondent in Maryland writes us, that both the red and white grow abundantly there. The seeds of both kinds are scattered by birds, and we do not doubt but in a few years the white will be found springing up in our woods, as though it were indigenous. Mr. Rind has also introduced seeds of the Asiatic mulberry, from Constantinople; and D. Ruggles, Esq., of Newburgh, has twelve or thirteen thousand plants, from this seed, growing in his nursery. The leaves are intermediate in size between those of the white and Chinese species; and there is another, we believe from Italy, similar to the Asiatic, and possibly the same, which has been growing some winters in our nursery, uninjured by frost. But for the present, reliance can only be had on the white and Chinese, not only because they are reputed to be best, but because the others cannot be immediately procured in sufficient quantities. Of the first only can seeds be procured, and this is the season to provide them. Plants of both kinds may be had at most of the public, and at many private nurseries. W. Thorburn, in Albany, sells the seed at fifty cents the ounce, and the eggs at eighteen to twenty-five cents the thousand. An ounce of seed will give from two to three thousand plants.

The statements in regard to profits are extremely variant, which depends undoubtedly upon good or bad management. The estimates of sixteen individuals, in Roberts' Manual, vary from $72 to $2,664, as the products of an acre, in money, averaging about $1,000 per acre. The editor adopts $565 50 as the nett profit of an acre of full grown trees. Dr. Comstock, the author of "A Practical Treatise on the Culture of Silk," puts its down, as a safe calculation, that from $125 to $150 nett profit, may be expected from an acre of full grown trees. The lowest estimate is always the safest one for beginners.

We must refer to page 51 of vol. ii. of the Cultivator for directions for sowing the seed, and managing the plants in the seed bed, with this further direction, that in northern latitudes, it is a good precaution to cover the plants while in the seed bed, in winter, with coarse litter from the cattle yard or elsewhere.

The mulberry may be also propagated by layers, suckers and cuttings, and by the ordinary processes of grafting and budding. These modes of increase are seldom applied to any but the Chinese kind. Sprouts often spring from about the surface of the ground; and if these are earthed up they will throw off roots, and after a season may be separated from the parent stock and transplanted. Or these may be bent down to the earth, and converted into layers.

The Soil best adapted to the mulberry is a light loam, though they will grow in almost any soil not habitually wet. Stony ground, unfit for tillage, is as good as any for them.

The best aspect for a mulberry plantation is one sloping to the south or south-east and south-west; and it is advantageous to have it sheltered on the north and west by woods or high grounds.

Manner of planting.—If the business is to be managed on a small scale, and only a few trees planted, these may be put out along fences, at the distance of twelve to fifteen feet apart, and trimmed up as they grow, so as not to incommode teams in the ordinary field labour. The holes for the plants should be three feet in diameter, and eighteen inches deep, and filled up to a sufficient height to receive the plant, with surface mould. In this the tree should be planted no deeper than it stood in the nursery, as when the ground has become compact, it will have settled an inch or more. The plants for this purpose should be from one to two inches in diameter at the butt. Those who contemplate going into the business largely, have a chance of three modes of planting, viz: as standards, in fields to be used for farm crops; as half standards, in grounds to be wholly appropriated to their growth; and as dwarfs, planted as hedges to divide fields, or otherwise. In the first instance, the directions given for planting and pruning fence trees will apply here, and their distance may be fifteen feet, or more, to suit the taste or convenience of the proprietor. If half standards are to be cultivated, and the ground ultimately to be appropriated to their growth, the ground should be ploughed deep, and if trench ploughed the better, and well pulverized, and the trees planted four to eight feet apart in double rows, that is, two parallel rows four feet apart, leaving intervals for the passage of a cart between each double row. Plant in quincunx, putting the plant in one row opposite the interval between two trees in the other, thus ˙ . ˙ . Half standards need not be pruned, except of such limbs as fall to the ground. Branches will spring from near the surface, and the intervals will be filled, in a few years, with thrifty foliage. For two or three years the intervals may be ploughed carefully, and cropped with potatoes, beans, &c., the tillage of which will facilitate the growth of the mulberries. Plants for half standards may be taken from the nursery at two years, and if very thrifty, at one year old. In all cases it is advisable to transplant the mulberry, at the north, in the spring, and the earlier the better. The object of this mode of planting is, to raise the greatest quantity of leaves from a given area of ground, and to facilitate the gathering of them. When required for a hedge, the plants may be one or two years old. A neat way of training this hedge is to cut down the plants the first year, to within four or six inches of the ground, leaving two buds, and after another year's growth, to bend down or lay one of the new sprouts in the line of the fence, and tie it to the next plant, and to leave the other sprout to grow upright. The buds from the laid sprout will send up shoots and fill the intervals. The plants may be set fifteen inches apart. Sprouts springing from the roots should in all cases be cut away, unless they are wanted for layers. It is recommended that small trees, intended for spring planting, should be taken up the preceding fall, and buried in great part or wholly, to protect them from injury during the winter.

The Cocoonery is the place where the worms are to be fed, which should be sufficiently tight to protect them from stormy or severe weather, and so fitted that it may be thoroughly ventilated when the weather is mild and fair. A spare room of the house, or an out building, will serve for beginners on a small scale. This must be furnished with a table, or shelves, to deposite the worms upon. The best way seems to be to frame four posts together, say four by three feet square, into which are fitted three or four frames for the worms to feed upon, the centre of which to be filled with meshes of catgut or twine, and others directly under them, covered with paper. The object of which is, to have all the filth and excrements pass through the meshes on to the paper slide, which may be withdrawn and cleaned without disturbing the worms. The paper frame should be so near the other, that if the worms fall through the meshes, they may be able to reach it and get up again, which they will do for the leaves, which are always laid upon the mesh frames.

XVIII.—IMPLEMENTS, &c. OF THE FARM.

In this branch of our subject we shall examine very briefly the mechanical agents or implements, machines, &c., employed in agricultural operations. Though the most important implements of agriculture are drawn or put in action by beasts of labour, yet a few which cannot be dispensed with, are used by *man alone*. These of course will be noticed in their proper place.

It is rarely, indeed, necessary that the farmer shall himself be able to construct machines; because in all places where the arts are cultivated, there will be found a class of artisans, who can supply to him the common instruments of which he stands in need, and at a price much less than he can construct them. But it is nevertheless proper that he be acquainted with the principles upon which his machines should be constructed, and so be able to supply, if necessary, the want of skill in the workman.

THE PLOUGH.

The plough being the fundamental implement of agriculture, is common to all ages and countries, and, in its primitive form, is almost every where the same. Those used by the Greeks and Romans, spread over Europe, and underwent, probably, but little or no change until the sixteenth century, when they gave way to the improved Dutch and Flemish ploughs.

In the seventeenth century the plough underwent further and highly important improvements, particularly in England; and in the eighteenth it was still further greatly improved in Scotland—and the improved Scotch plough, as it was then called, is still in high repute in many of the best agricultural districts.

Our early agricultural implements, and the models of some now in use among us, were derived originally from the mother country—Britain. There are now a great many different sorts; and, besides the variety of construction occasioned by the difference of soils, and the various purposes for which they are employed even on the same soil, there is a considerable diversity in the form, in districts where both the soil and mode of culture are nearly similar.

The parts of a plough are the *beam*, or that part which carries the coulter and furnishes the point of draught; the *head* is the plane on which it moves; the *soc;* the *mould board;* the *coulter*, a sort of knife inserted in the beam, and so placed before the soc as to cut the sod; and the *handles*.

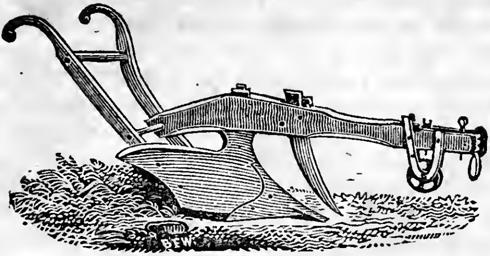
Much improvement has been made in this country in the construction of ploughs, within the last few years. The objects desirable to be obtained are superiority of work, saving to the farmer in time, in repairs, in power of draught, and in the rapidity of performing work. A plough should be strong, durable, cheap, and work easy. *Wrought* and *cast iron* ploughs have come into use, and are recommended by many as preferable to those made of common materials. Among the number of cast iron ploughs is that known as Prouty and Mears's Patent, which is held in very high estimation by those who have tested its merits.

Some twenty or thirty years since a cast iron plough was invented by a Mr. Jethro Wood, which for a time was very popular among many of the New England farmers; and, we believe, that at this day it is still used and held in high estimation by some, especially those who follow in the footsteps of their fathers. Mr. Wood's plough was unquestionably the best then in use—but it had its imperfections; these, however, have been corrected, and the plough now in extensive use, manufactured by Ruggles, Nourse and Mason, is simply Wood's plough improved.

By the *trench plough*, two or more slices are taken with the same instrument. The first cuts off the weeds and stubble, and deposits them at the bottom of the furrow; the second slice is then turned over the former, and completely covers it.

Side-hill or *swivel-ploughs* are coming into extensive use, having been recently very much improved; they are peculiarly adapted for hilly grounds, but may be so constructed as to answer every purpose of the common plough. They enable the farmer to plough without making dead or land furrows, and also admit of the breaking up of the land very near to fences, &c.

Double furrow ploughs are recommended from high authority, as saving the attendance of one person, and doing nearly double the work in the same space of time, with little additional strength in the team.



PROUTY AND MEARS'S CENTRE DRAUGHT PLOUGH.

Through all the various improvements and alterations which have been made in the construction of the plough, the uniform practice has been to raise or set the landside on a right angle to, or perpendicular with, the plane of the base, over which the beam has been placed on an acute angle with the line of the landside, carrying the forward end towards the furrow about three inches from a continued line of the landside, to incline the plough to land, or retain its proper width of furrow. The effect has been an irregular, unsteady, struggling motion, which effect is increased as the plough is shortened, and the furrow-slice, being cut and raised with a square edge, is very liable, as it falls over, to rest upon the furrow last turned and not shut in level. Ploughs made of cast iron are necessarily shorter than when made of wood or sheet iron, to prevent their being too heavy and cumbersome, and late improvements in agriculture and the practical use and good effects of tilling the ground with short cast iron ploughs, having brought them into general use, the necessity of adopting some principle, if possible, to the plough to run more uniformly level and steady, and at the same time to form the furrow-slice into such shape as to ensure its closing and shutting in level, has been seriously felt.

The principle adopted in the construction of this plough, is to set the landside on an acute angle with the plane of the base, so that the beam is laid on a line parallel to, and continuous with, the line of the landside, and so far over the furrow as to give the plough a sufficient inclination to land, thus causing a straight forward and uniform motion, and the furrow-slice being cut in the form of an oblique-angled parallelogram—*or a board with feather edges*—falls in and shuts more readily and uniformly with the furrow last turned, leaving the land when ploughed in the best form for the after-tillage, and by covering all stubble and green crop completely under, and leaving the surface level, light and friable, fits it for the production of good crops, requiring less strength of team to draw the plough, and less effort of the ploughman to govern it.

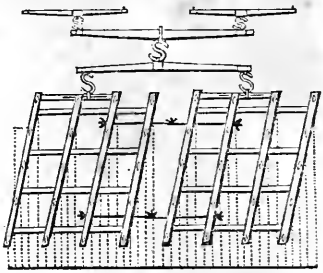
The head or top of the landside being broad, and transversely parallel with the head of the base, and extended back from the bolt which fastens the beam, so as to make a bearing for the beam to rest upon, serves as a guide for the workmen to lay the beam by, and as a brace to prevent the downward pressure of the after end of the beam upon the landside of the plough. The point being under a rock or stump, and being notched into the beam, protects the standard bolt which fastens the beam to the plough. The mould-board and share is formed in that gradually winding shape which is found by experience to be best adapted to the purpose, turning and laying the furrow in the best possible form for the after-tillage, the production of good crops, and with the least possible resistance.

THE HARROW.

The *Harrow* is an implement of equal antiquity with the plough, and has of late years undergone so much improvement as to have originated that class of pronged implements, known as cultivators, grubbers, &c. Harrows are implements of essential importance in the management of farm lands, not only for the purpose of covering the seed with the earth, but likewise for more effectually pulverizing the soil after it is broken up by the plough, previously to its reception of the seed.

As the operation of harrowing is performed on all the varieties of soils, brought into a state of cultivation, it therefore requires instruments of different size and strength, and as the objects for which they are employed, though nearly similar, yet vary in detail, it is manifest that they should differ in form. But they have nevertheless, until within the last few years, been both made and worked without any material alteration, upon the same principle on which they have been used for ages.

THE BERWICKSHIRE HARROW.



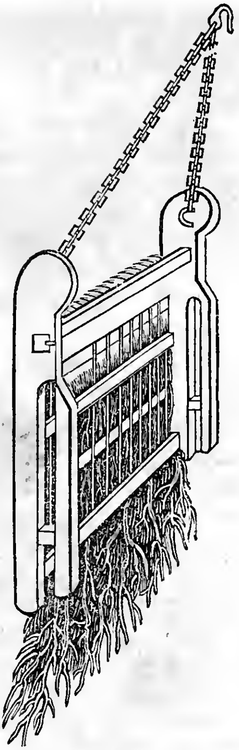
The *Berwickshire Harrow* is said to be the most perfect implement of the kind now in use in England. It consists of two parts joined together by iron rods, having hasps and hooks. Each part consists of four bars of wood, termed bulls, and connected together by an equal number of cross-bars of smaller dimensions, morticed through them.

The former of these bars may be two and a half inches in width, by three inches in depth, and the latter two inches in width by one inch in depth. The longer bars are inclined at a certain angle to the smaller, (see engraving,) and they have inserted into them teeth at equal distances from each other. By this means, when the implement moves forward, the various teeth equally indent the surface of the ground over which they pass.

The harrow represented in the preceding figure, of which the frame is of wood, and the teeth of iron, are connected together in pairs by hinges. The number of teeth in each is twenty, five being inserted in each of the larger bars.

Sometimes a light kind of harrow, with a greater number of teeth, is used for covering the smaller seeds, as those of clovers and the grasses. These light harrows do this species of work better than the common kinds, and hence many farmers have one or more pairs of them, for the specific purpose of covering the smaller seeds.

The *Brush Harrow* is used for harrowing grass lands, to disperse roughness and decaying matter: and it is also sometimes used for covering grass or clover seeds. Small rigid branches are interwoven in a frame, consisting of three or more cross-bars, fixed into two end pieces in such a manner as to be very rough and bushy underneath. To the extremities of the frame before are sometimes attached two wheels, about twelve inches in diameter, upon which it moves—sometimes, however, the wheels are omitted, and the whole rough surface is applied to, and dragged on, the ground.



THE BRUSH HARROW.

Conklin's Revolving Press Harrow, a new invention, somewhat resembling the English spiked harrow. It consists of two cylinders twenty inches in diameter, three feet long, formed of cast iron staves, &c. The teeth, which are either of wrought or cast iron, are inserted in the staves, and fastened upon the inside by nuts or keys. The design is—1. To scarify meadow or pasture grounds, root out mosses, fit them for seed, and thus increase the product. 2. To scarify stiff clays and tough sward grounds, after they have been once ploughed, which this harrow pulverizes and fits for the crop.

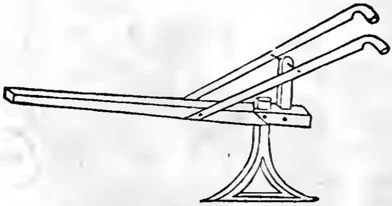
The *Grubber* is an implement scarcely known, and consequently but little used in this country; while in England and Scotland it is in almost universal use. Its office is to turn up noxious weeds whose roots may have been turned down by ploughing, below the reach of the harrow, which cannot penetrate any distance into the ground, and drag up the roots of plants beneath the surface.

The introduction of this class of implements into tillage, must be regarded as beneficial and important. When land is full of root weeds, the repeated operation of the plough, the harrow and the roller, is resorted to for tilling and cleaning it. In these cases the grubber is a useful assistant, and may frequently supersede the necessity of one or more ploughings.

The grubber can be made to go any depth which may be required, and thus the soil can be either stirred to the depth at which it had been originally ploughed, or to such lesser depth as may be deemed expedient. It is in this respect greatly superior to the harrow, which we cannot regulate in this manner.

The employment of the grubber, however, does not supersede that of the harrow in the pulverization of the ground, and disengaging of the roots of weeds. The harrow is still to be used, in conjunction with the grubber, and especially for collecting into heaps the roots of the plants brought to the surface.

COULTER FOR LOOSENING THE SUB-SOIL.



This is a valuable implement on tenacious clays or stiff soils. It loosens up the earth for several inches deeper than our common ploughs go, without bringing the earth or sub-soil from below on to, or mixing it with the surface soil. One horse attached to it, and walking in the furrow after the common ploughman, will effect all that is required.

This process of stirring the earth to a greater depth than is usual in common ploughing, will, in time of much wet, suffer the superabundant moisture to sink away, and not injure the plants by diluting their food too much; while in time of drought the fibres of roots are enabled to penetrate to a much greater depth in search of their appropriate nutriment.

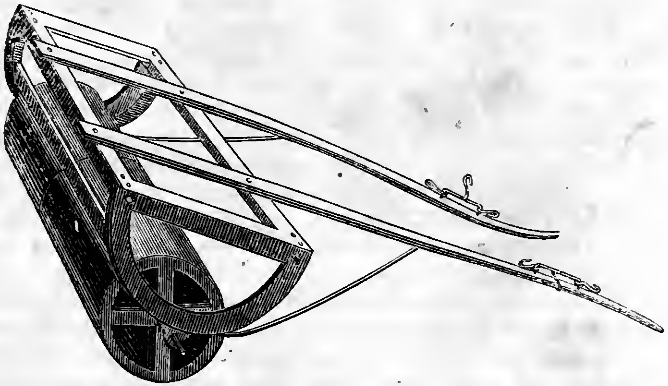
James M. Garnett, Esq., an ardent friend of agriculture, introduced this improved implement into Virginia. He met with it accidentally on board a steam-boat, but could obtain no authentic account of its origin, when, where, or by whom invented. He was so much pleased with it that he made a sketch of it, and on his return home he had one made, of which he gives the following account.

"I have been using it ever since with a decided preference to all others. None, of which I have any knowledge, are superior to it, in any one respect, while this is superior to them all in two important particulars. 1. You may wear out both points, by reversing them, before you send it to the smith. 2. The point which works behind causes the coulter to run much more steadily.

"The lower part is made out of inch square iron, flattened, and well steeled at the points, and is twenty-two inches long. The upright part is of bar-iron, two and a half or three inches wide, by half an inch or five-eighths thick, and should be seventeen to eighteen inches high from top to bottom, and left square on both the front and hinder edge.

"A half inch bolt will suffice to fasten it in the mortice through the beam, which should be at least four by three inches at that part. A band of round, half inch iron, should also be fixed on that part of the beam, so as to rest against the front edge of the coulter above, and its back edge below, which will keep it firmly fixed in the mortice."

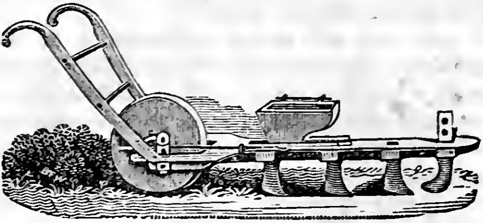
THE ROLLER.



The *Roller* is constructed of wood, stone or cast iron, according to the convenience or purposes for which it is to be used. For tillage lands, the roller is used to break the lumps of earth, and to press in and render firm the ground about newly sown seed. So important is the roller become, within a few years, that no farmer can consider his stock of agricultural implements complete without it.

They are principally constructed on two plans; the one consists of a single cylindrical piece of timber, set in a frame, in which it revolves by gudgeons; the other, of two such timbers, each of which is half the length of the single one. The latter is preferable in the turning of the angles of fields and lands. Some prefer the stone roller. There are also a variety, some of which are patented.

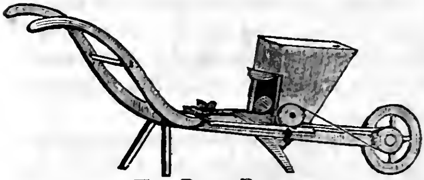
MACHINES FOR SOWING SEEDS, &c.



BUCKMINSTER'S SEED PLANTER.

This implement is of recent and simple construction, has been fully proved, and found to answer for the planting of corn, sugar-beet, ruta-baga, mangel-wurtzel, turnip, and other like grains. It deposits the seed either in hills or drills, as the operator may desire. The great superiority of this over other corn planters is, that on ground previously prepared in a proper manner, a man with one horse will furrow out, drop, cover, and press down the seed on an acre of ground in one hour—or ten acres per day.

The seed is covered by falling into the furrow of the soil, which is finely pulverized by a row of cultivator teeth. The seed is deposited in the fresh earth, and immediately rolled, without being exposed to the action of the atmosphere. The machine will bury the seed three inches deep if desired—one inch is the rule for corn—one-fourth of an inch for turnips. By simply turning a screw you sink the grain or seed deep; by turning it back you plant more shallow. It is made of cast iron, except the handles.

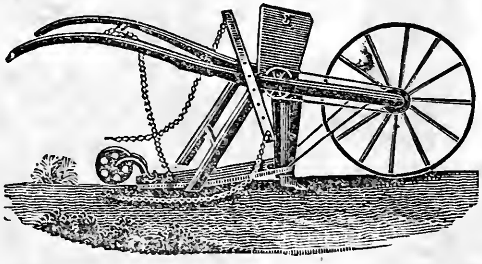


THE DRILL BARROW.

The *Drill Barrow,* which is made in different forms, and is used in sowing various small seeds, such as turnips, onions, radishes, peas, beans, lucern, &c. is propelled like a wheel-barrow, and sows and covers the seed at the same operation. The one figured above, is used to some extent in New York, and in many other places. It is highly commended.

Bement's Improved Turnip Drill is an implement of much value. It was originally simply a modification of the old English Northumberland turnip drill. But it has undergone such modifications and improvements, that it is now adapted to the planting of beets, peas, onions, carrots, and other seeds of a round or oval shape. The wheel by which it is impelled, serves the double purpose of covering and pressing the earth to the seed; thereby, as in the case of the corn planter, causing a much more rapid vegetation.

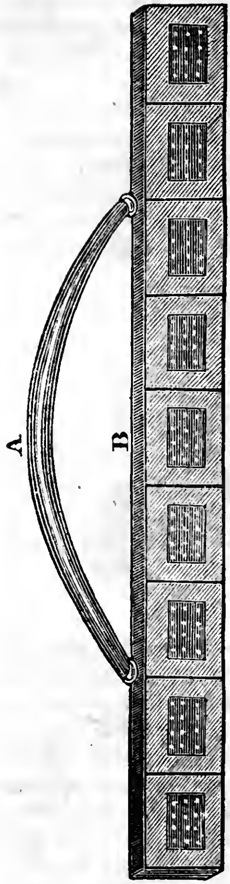
Merchant's Drill Barrow is an implement of peculiar simplicity and cheapness, and will be found to be very economical and useful in the sowing of turnips, onions, radishes, beans, beets, and similar seeds by manual power; and by multiplying the wheels, or rather by uniting several machines for horse power, it may be used in field culture for sugar-beet, ruta-baga, wheat, &c.



Willis' Seed Sower.

Willis' latest Improved Seed Sower, invented the last season; one of the most perfect machines ever introduced for the purpose. In using this machine, the farmer may be certain that his seed is put into the ground, and at the same time in the best possible manner. There has been a great difficulty in machines for sowing garden seeds; they are very apt to clog up, and the farmer might go over an acre of land and not sow a single seed; but not so with this; it is so constructed that it cannot possibly clog. In using this power, the farmer can save one half of his seed, and do the work at less than one quarter the expense of the common way of sowing his seeds, and have it done in a much better manner; it opens the furrow, drops the seed, covers it over and rolls them down. It will sow almost any kind of garden seeds; say ruta-baga, mangel-wurtzel, turnips, carrots, beets, parsneps, onions, &c. It is highly recommended by a great number of persons who have used it.

The *Clover Box* is exceedingly simple in its construction, easily made, and at small expense. In some sections it is in general use: the seed is not only placed in the ground with entire certainty and equality, but a much less quantity is sufficient than is usually required by the old process. By the use



CLOVER BOX.

of this box, one bushel has seeded fifteen acres, the clover well set, the plants in sufficient numbers, and the whole field evenly seeded.

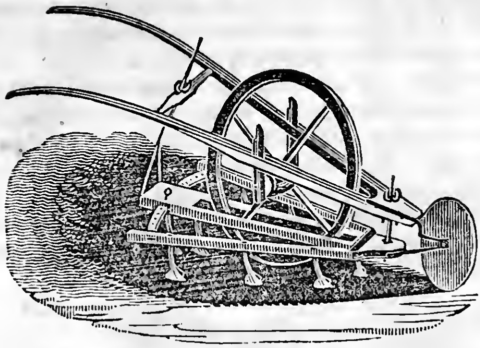
The box is eight or ten feet in length, about four inches in breadth, divided into partitions of six inches long. In the bottom of each partition is an opening of about three inches square, in which is inserted a piece of tin, parchment, or stiff paper, perforated with a number of holes of sufficient size for the clover seed to pass freely through.

The seed is placed in each partition. To the box is affixed a strap, which is passed over the shoulders of the sower, and carrying the box before him, he walks over the field, agitating the box by his hand if it requires more movement than it receives from his walk. In this manner the seed is equally distributed over all the ground.

A very thin piece of board may be hooked at the bottom of the box, to prevent the seed dropping out before the sowing commences. The box may be made of light cedar, and not weigh more than six or eight pounds without the seed.

The Broadcast Hand-Drill is used chiefly for sowing clover, and other small seeds, with or without grass seeds. The operation is still, however, much more frequently performed by hand. On farms of a large size, where there is a uniformity in the surface of the soil, in moisture, and in richness, broadcast sowing by machinery, drawn by cattle or horses, may be advantageously adopted.

HAND CULTIVATOR.

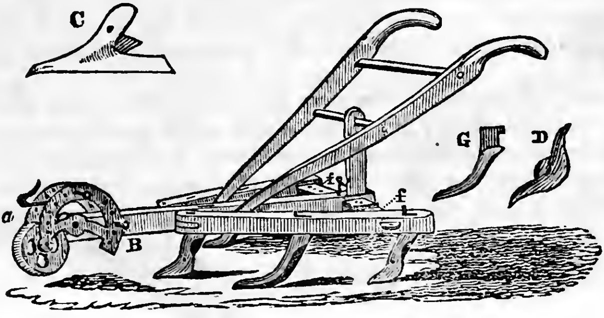


The *Cultivator.* The great utility of the Cultivator in dressing corn, sugar-beets, ruta-baga, and indeed all hoed crops, destroying weeds, and pulverizing the soil effectually and cheaply, is so manifest, that it has almost entirely superseded the use of the common hoe. No good farmer will now use the plough in the after culture of his corn, &c. Those so constructed as to admit of being widened or contracted at pleasure, called the expanding cultivators, possess decided advantages, for many purposes, over the others.

By being passed frequently between the rows, the ground is kept free from weeds, and in a fine state of pulverization, while the manure and vegetable matter is left under cover, to impart their beneficial and fertilizing effects to the roots of the plants, which are preserved from injury.

It should be passed twice at a dressing, and if the soil is stiff or grassy, it may be passed oftener, or repeated at short intervals. The teeth are of various forms, according to the purposes for which they are used.

BEMENT'S CULTIVATOR.



Bement's Improved Cultivator or Horse-Hoe is so constructed that it is adapted to soils of different textures, being furnished with shares of peculiar forms, according to the nature and character of the soil to be operated on.

A very simple, cheap and efficacious implement is in use among the farmers along the Delaware for dressing the ruta-baga, sugar-beet, &c. It was invented by MAHLON S. KIRKBRIDE, who calls it the *hoe-ta-baga*. It is a great improvement on the German scuffle; with the addition of the wheel and lancet-cutter a man may easily dress an acre and a half per day, the rows two feet apart. The machine may be made for about two dollars.

THRESHING MACHINES.

The saving of manual labour, and that of a severe kind, by means of the invention of *threshing machines* is perhaps beyond calculation—while the grain is separated from the straw in a more perfect and expeditious manner than has hitherto been accomplished by any other mode. Nothing can be more objectionable than the old mode of separating the grain by the feet of horses and oxen; and no labour was more fatiguing than threshing it by that tedious and defective instrument—the flail.*

Threshing mills are driven by various powers, as by horses, oxen, wind—wind, and horses when wind fails—water, or horses when the water is deficient—and steam. Some small machines are driven by manual labour, and although they may be adequate to thresh the crops of a small farm, yet we would recommend the application of horse power in preference. The machines ought to be constructed in the most substantial manner.

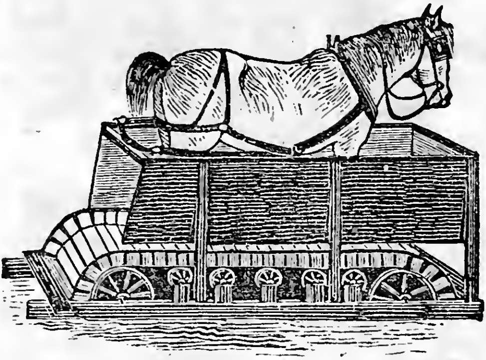
There are a variety of machines of this character in use, all of which have their advocates. Those first invented were very imperfect, but of late great changes and improvements have been made in their construction, and they now rank among the best and most important of the labour-saving machinery of the farm.

Allen's Threshing Machine is, we believe, among the best of the kind. It occupies but a small space, but little power is required to propel it, and it is afforded at a moderate price. The thresher is a cube of two feet square, that is, two feet broad, two long and two high; and such is its compactness,

* Sir JOHN SINCLAIR.

that the whole machine, including the horse power, may be stowed in a light wagon, and transported by a single horse, if necessary.

Vosburgh's Threshing Machine, for which a patent has not been obtained, is nevertheless an excellent implement. It is a cylinder, working horizontally over a concave armed with teeth. The horse power is fixed and permanent.



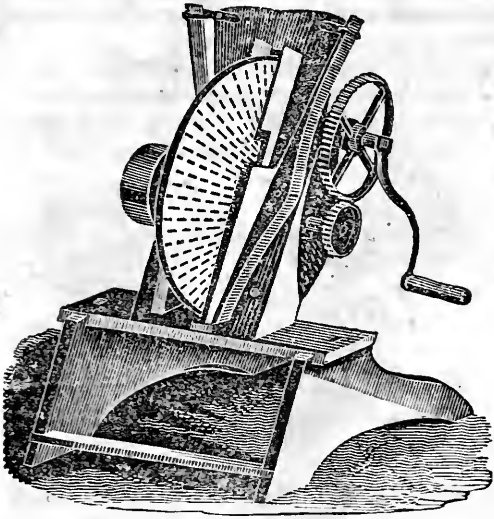
HALE'S IMPROVED HORSE POWER AND THRESHER.

This *Horse Power* occupies only the small space of nine feet by two, can be easily transported from place to place, and is very simple in its construction. It is now in extensive use, and is well calculated to operate on any kind of machinery or agricultural implement.

There are a variety of threshing machines, among the best of which are *Pitts' Horse Power and Thresher*, and *Warren's Hand or Horse Thresher.*

CORN SHELLERS.

A *corn sheller* is one of the most valuable and convenient labour saving machines now in use. A great variety of machines for this purpose have been invented, and introduced to the notice of the farmer. Among those most in use, is HARRISON'S. The wheel of this machine is vertical, and is turned with a crank by a single person. It can be applied in all cases for large or small sized ears; and will shell from ten to twelve bushels of corn per hour.



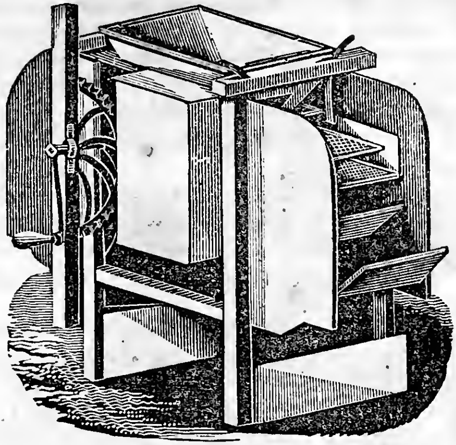
PATENT CORN SHELLER.

The Improved Double Operating Corn Sheller will shell two ears of corn at the same time—can be worked by hand or any other power—is very durable and not liable to get out of order, and is one of the most convenient and labour saving machines used by farmers.

Adriance's Patent, and *Maxwell's Self-feeding Corn Sheller*, are both in high repute; simple in their construction, durable, and not likely to get out of order. They are light, portable, and easily removed from place to place.

The *Winnowing machine* is designed to remove the husks or chaff from the grain, and to separate the impurities or refuse intermixed. With certain variations in the form of its parts, the principle of construction of this machine is, in most places where it is used, the same—there existing a very strong family likeness among all that we have seen.

WINNOWING MACHINE.



Holmes' Winnowing Machine is well calculated for cleaning all kinds of grain, and can be applied to other purposes—such as cleaning rice, coffee, &c. It is simple in construction and efficient in operation.

Thomas' Improved Grain Cleanser has acquired high reputation wherever used. It is compact, occupying a space of only six feet square, strong, durable, with care, and in the most expeditious manner separates from the wheat every particle of smut, dirt, seeds and dust, without the smallest loss or waste of grain.

IMPLEMENTS FOR PREPARING FOOD FOR LIVE-STOCK.

In many cases, indeed we might say in all cases, it is beneficial to prepare the food to be used by the animals of the farm, in various ways. The most important class of implements used for this purpose in Europe, is that for cutting or slicing of roots, as they are generally fed in a raw state to sheep and oxen.

The straw or chaff cutter, is a machine employed for cutting hay and straw into pieces of a given length. By this process, it is found that the dried stems of plants can be more easily consumed by cattle, and, therefore, afford more nutriment.

In this class of machines, the hay, straw, or other substances to be cut, are placed in a narrow oblong trough. They are then pressed forward to two revolving cylinders, which, while they hold them with firmness, gradually carry them through. They are then acted upon by one or more knives. At each stroke of these knives, a portion of the straw or other substance is cut off, of the length required.

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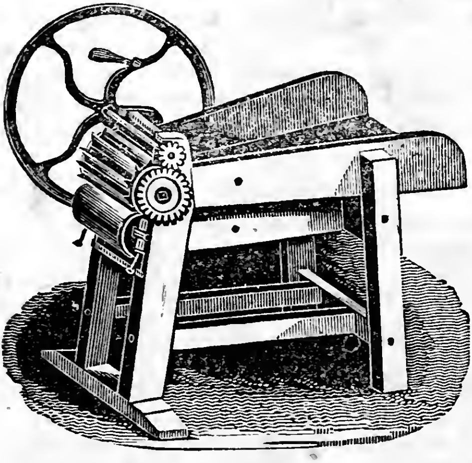
The desiderata in the construction of the machines, are causing the knife to make the stroke in the most efficient manner, which is done by placing them in an oblique position, causing the straw or hay to be brought forward, to be acted upon by the knives with regularity, and so adapting this to the several strokes of the knives, as to vary the length of the cut according to the degree of fineness to which it is wished to reduce the stems.

There are a number of straw and chaff cutters in use, of all sizes, varieties, patterns and prices. Owing to the great improvement and simplicity of these machines, the work is done with great expedition and facility. They are of great value to the farmer.

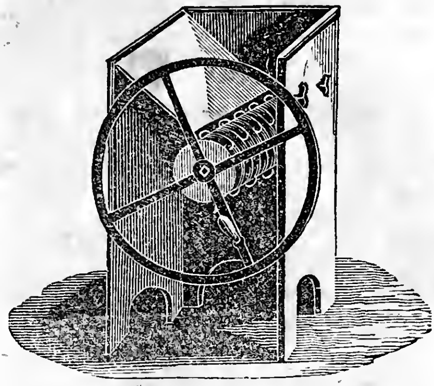
Green's Patent Straw, Hay and Stalk Cutter is very simple in its construction, and being made and put together very strong, is not liable to get out of order. By the application of a mechanical principle not before applied to any implement for this purpose, the machine will cut easily two bushels per minute, requiring only the strength of a boy to operate it. The knives require less sharpening than those of any other straw cutter, owing to the peculiar manner in which they cut.

GREEN'S PATENT STRAW CUTTER.



Willis's Improved Vegetable Cutter for cutting large or small roots. The great objection to all other machines is, their cutting the roots into slices, which makes it almost impossible for the cattle to get hold of them; this machine, with a little alteration, cuts them into large or small pieces, of such shape as is most convenient for the cattle to eat. It will cut with ease from one to two bushels of roots per minute. No farmer should be without one of these machines.

VEGETABLE CUTTER.



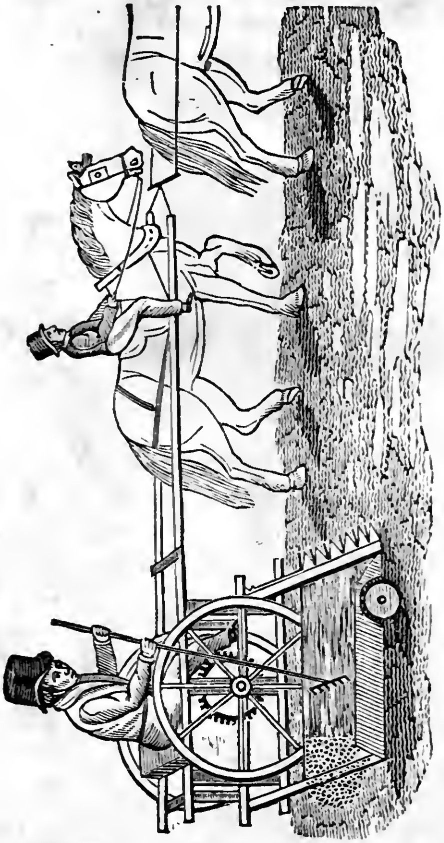
MOWING AND REAPING MACHINES.

"Though reaping machines," says the Editor of the Encyclopædia of Agriculture, "are as old as the time of the Romans, one of an effective description is yet a desideratum in agriculture unless the recent invention" of Mr. OBED HUSSEY, can be considered as supplying that desideratum.

Wilson's Mowing Machine or Grass and Grain Cutter is highly recommended by gentlemen who have tried it. It is principally used along the Hudson river. It is a machine of much promise, and is, we presume, an improvement on the best of the English reaping machines, that invented by SMITH, of Perthshire.

Hussey's Mowing and Reaping Machine is, perhaps, superior to any other, for its simplicity, durability, and the great facility and regularity with which it performs its work. It does its work clean; and one great quality is, that if the grain is too much lodged to be cradled, it will cut it at the rate of two acres per hour, nearly as clean as if it had been standing. It can be adapted to the inequalities of the surface of a field, and has been so improved by the original inventor, (Mr. OBED HUSSEY,) as to operate with great facility on stony land.

This machine has received the spontaneous and unqualified recommendation of all farmers who have tried it, or who have witnessed its operations. The Board of Trustees of the Agricultural Society for the Eastern Shore of Maryland, in their Report, made in 1836, say, "We deem it a simple, strong, and effective machine, and take much pleasure in awarding unanimously, the meritorious inventor of it, (Mr. O. HUSSEY,) a handsome pair of silver cups."

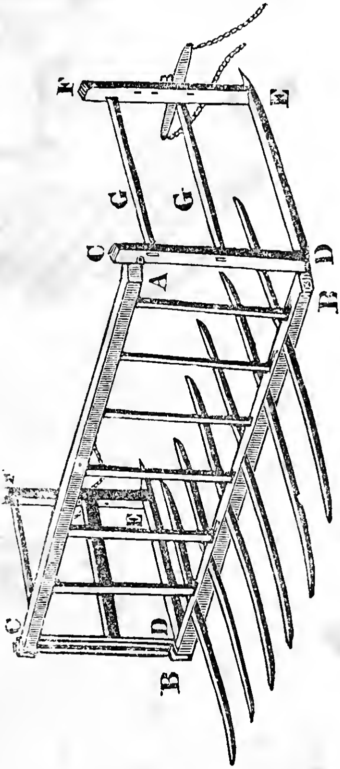


HUSSEY'S PATENT REAPING MACHINE.

The Committee appointed by the "Philadelphia Society for Promoting Agriculture," to superintend the operation of Mr. HUSSEY's machine, make a very favourable report, recommending it to the attention of the society and the agricultural community generally. They state that it was put in operation in a piece of several acres of heavy wheat, considerably lodged, and contrary to their expectations, it performed remarkably well.

"The committee estimate the ordinary performance of the machine at from ten to twelve acres per day; although they fully believe, that on an emergency, it would accomplish twice this amount of work. In confirmation of this they would state, that it cut on this occasion, six hundred and thirty square yards in two minutes, doing its work in the most perfect manner."

THE HAY-SWEEP.



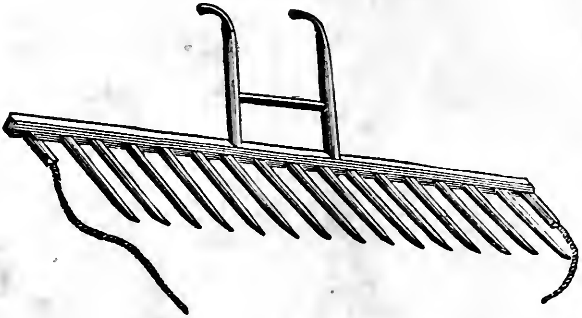
The object of the Hay-Sweep is to collect and draw the hay from the winrow to the stack, or place of deposit. It consists of a piece of scantling, A A, 3 by 4 inches, and 10 feet long, united by seven upright bars of wood, 1 by 2 inches, and 3 feet long, to another piece B B, 4 by 5 inches, and 10 feet long; through the latter, six holes are made in a horizontal direction to receive the teeth, which are pieces of very strong wood, 1½ by 4 inches, and so long as to project two feet and a half on each side of the piece B B, and tapering on their under side like the teeth of a horse-rake, so as not to run into the ground. At the ends of the pieces A A, B B, are attached two frames C D E F, termed gates, by strong hinges so made that the gates may turn round upon them through half a circle. These gates consist of two pieces of scantling 3 inches square and 3 feet long, united by two bars of wood G G, each 1 by 2 inches, and 3 feet long, and a third D E, 3 inches square, tapering on the under side like the runner of a sled, and projecting a few inches beyond the upright piece F E. The whipple trees are attached to the upright pieces F E, a little above the middle; they should admit of being raised or lowered in order to adjust the height exactly, which is readily determined by trial.

The mode of using this instrument is as follows:—A horse is attached to the whipple-tree at each end, and the length of which is to be regulated to the draught in such a way that the bottom of the gate may keep the teeth from running into the ground, and yet under the hay.—Not the least management or skill is further required; a small boy is placed on each horse, and passing on each side of the winrow, sweep it off, and carry it to the stack. On arriving there, the horses are turned about, causing the gates to perform a semi-revolution, and drawing the instrument out from under the heap of hay, and they proceed as before to bring up another load. The teeth on each side of the piece B B are thus alternately used. In order that the hay may be easily pitched, it is indispensable that the load be left at the stack, so that the back of it may be pitched first. From three to five hundred pounds of hay are generally carried in each load.

As a labour-saving machine, where the distance of drawing is not great, this is fully equal if not superior to the revolving rake. Two horses and two boys only, are needed in using it. One will draw fast enough, in ordinary cases, to keep three pitchers and three stackers constantly at work. With this and a revolving rake, ten acres of hay may be cleared from the ground in half a day. It leaves the meadow as clean as is done by a common rake. The cost of making is not more than three or four dollars.

The *Common Horse Rake* is much used in many parts of the country—it is so simple in its construction, that we believe with the aid of the following cuts or illustrations, and the full description which is given, will enable any common carpenter to construct either the common or revolving rake.

THE COMMON HORSE RAKE.



This is made of a piece of strong scantling, three inches square and ten feet long, into which about fifteen teeth are inserted horizontally, and made of strong white ash or other tough wood. The teeth should be about 22 inches long, and one inch by one and three quarters at the place of insertion, and tapering on the under side, so as to give them a slight turn upwards at the point, to prevent their running into the ground while using. The draught ropes are attached to the end of two projecting pieces of wood parallel to the teeth, at each end of the rake. These projecting pieces should be about one-third of the length of the teeth. Those unskilled in the use of the rake, sometimes attach the ropes at once to the ends of the head; in this way it becomes almost entirely unmanageable. The forward ends of the draught ropes are to be fastened to the horse's collar, leaving space enough between the horse and rake for the collecting hay. Handles, like those represented in the figure, are to be inserted in the head near the middle, for guiding the teeth and lifting the rake from the ground when necessary.

In using this rake, instead of the teeth moving onward upon their points as in the common hand rake, they run along flat upon the ground, passing under and collecting the hay; when full, the handles are thrown forward, the rake emptied, and lifted over the winrow for another load. The rake thus passes backwards and forwards across the field, always emptying opposite the last heap, and thus forming regular winrows at right angles with the path of the rake. A few hours practice will enable any one to use this rake without difficulty, the only skill required consisting in keeping the points of the teeth just so low as to pass under all the hay and yet not run into the ground. When small obstructions occur, the handles are depressed, thus causing the teeth to rise, and the rake passes freely over. Large obstructions, as stumps and stone heaps, require the rake to be lifted from the ground.

The chief recommendation of this kind, is its cheapness and simplicity. A good one need cost no more than two dollars. It may also be used on rougher ground than the revolving rake, as it is more easily lifted over obstructions. Where the ground is very uneven the teeth should be much shorter. When one becomes well accustomed to the use of it, work may be done nearly as fast with this, as with a revolving rake, though much more laborious. Twelve acres of hay, part of it yielding nearly three tons to the acre, on a meadow of the writer, were raked into winrows, by means of one of these rakes, in about *six hours*, working time. It possesses another advantage over the revolving rake—it may be used for scraping the winrows into heaps for drawing, and if the hay is stacked in the field, for drawing the hay to the stack. A man with a rake and horse, not only raked the hay, but drew it at the same time to the stack, a distance of from ten to twenty rods, as fast as an active man could pitch with a fork. A hand rake need scarcely ever be used on the meadow, as all the scattered hay may be raked up in a short time, after the rest of the hay has been drawn off.

The horse rake is very useful in raking stubble of wheat, and eminently so in pulling and gathering peas.

Shafts, instead of ropes have been attached to the head of the rake, and have been strongly recommended; but they diminish the simplicity of the rake, and appear to possess no advantage on the whole, and for gathering and drawing hay, are positively detrimental.

THE REVOLVING RAKE.

Fig. 61.

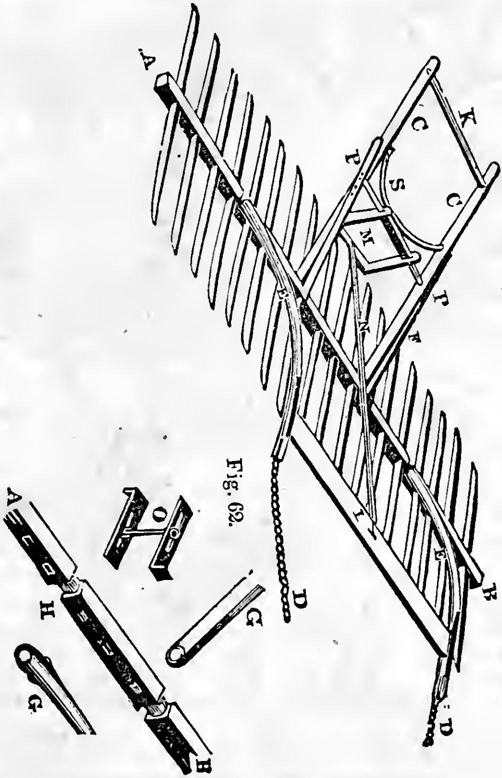


Fig. 62.

This is much more complex in its construction than the common horse rake, but possesses advantages over it in ease and expedition in raking. Its peculiar advantage is the facility with which it may be unloaded, requiring for this purpose but a slight elevation of the handles, and without stopping once in crossing the whole breadth of the meadow.

Its construction is as follows:—The head A B, fig. 61, is a piece of strong scantling, three inches square and ten feet long, through which eighteen holes, one inch square, are made to receive the teeth, which are pieces of the strongest white ash, one inch square and three feet long, projecting equally on both sides of the head when inserted, and forming a double row of teeth, each about eighteen inches long. The draught chains or ropes D D, are attached to the forward ends of two curved arms E E, which are connected at their other ends to the head of the rake by iron straps passing round the head so as to allow it to revolve freely. G, fig. 62, represents a portion of one of the curved arms, showing the hole formed by the iron strap, and H represents a part of the head which turns in this hole. These arms are held firmly together by the cross piece I. An improvement in the curved arms is made by constructing them of two pieces at right angles, in a form similar to a carpenter's square, the first or shortest piece rising perpendicular from the head, and the other projecting forward, and to which the draught chains are attached. By this construction, more space is allowed beneath these arms for the collection of the hay.

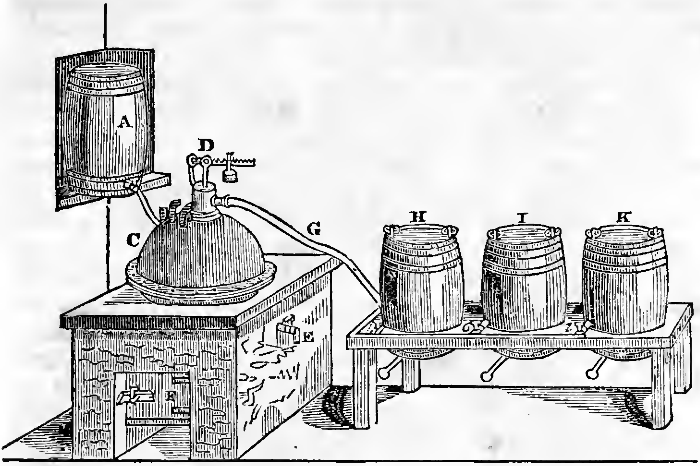
The cross rod K, connecting the handles C C, serves for guiding and managing the rake. These handles are connected to the head by a contrivance precisely similar to that of the curved arms. At the middle of the handles is a cross rod P P, upon which turns the small frame M, which is connected (by turning joints) by means of the rod N, to the cross piece I. This rod must be of just such length as to cause the frame M, when pressed down upon the teeth by the handles, to touch them within about half an inch of their points; by this, the teeth are pressed flat upon the ground while raking. To empty the load this frame is raised by the handles beyond the reach of the teeth, and they pass it freely without touching. The rake is unloaded by means of the following contrivance. Outside of the handles C C, are two pieces of wood F F, turning freely upon the two projecting ends of the rod P P, as pivots, with their lower ends resting upon pieces of iron fastened crosswise on the head of the rake, just outside of the joints connecting the handles to it. The shape of these pieces of iron is shown in a detached view at O, fig. 62. When the handles are raised, the pieces F F, are thrown forward on these pieces of iron, until they strike the projecting part of them, when they immediately act as braces, and cause the rake to rise with the handles. The points of the teeth thus strike in the ground, and the horse continuing in motion, causes the rake to make a semi-revolution, emptying the load, and throwing the back row of teeth forward to be filled as before. The handles C C, should be perfectly parallel, that the pieces F F, may play freely. S, is a strong iron brace, fastened at each end to the handles, and at the middle to the cross rod P P. The cost of this rake is about six dollars. The revolving rake is better adapted for use on large farms and smooth meadows, and the common horse rake on small farms and rough meadows.

A very easy mode of cutting turnips, potatoes or other roots into pieces for cattle, is by an instrument with four blades at right angles to one another. The root is struck as it lies on the ground, or in the feeding-trough, and thus at one stroke is divided into four parts.

MACHINES FOR BRUISING GRAIN.

A machine is used occasionally for bruising seeds, as of oats, peas, corn, &c., intended for the food of animals, thus rendering the mastication more perfect. There are different forms of these machines. They are sometimes driven by the hand, though this is better done by a power attached to the threshing machine; or, where this is not convenient, by a single horse power.

Perhaps the best construction of this class of machines is that of two plane rollers of large diameter, kept in rapid motion, the grain to be bruised being supplied from a hopper, so as to pass between them. The machines driven by hand, are convenient, as being portable; but the labour of driving them is considerable, and all the purposes of such machines may be served by having the seeds coarsely ground in any common grain mill.



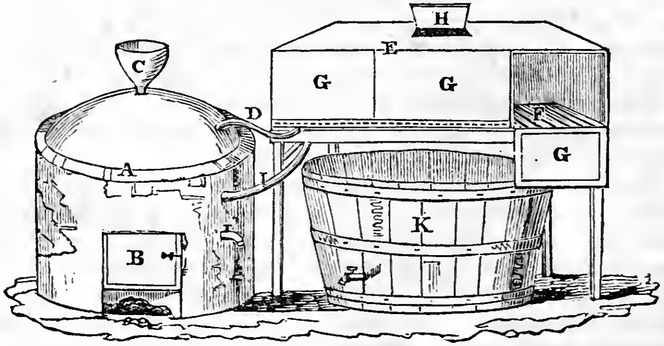
APPARATUS FOR BOILING AND STEAMING FOOD.

In numerous cases it is found to add to the nutritive properties of roots and grain, to boil them before they are given to animals. The most economical method of preparation, is by heating the water by means of steam, conveyed from the boiler to the vessel containing the roots or grain. Any kind of wooden box or barrel will answer the purpose, formed so as to admit of being readily filled and emptied.

The steam is to be conveyed in a pipe to the lower part of the vessel, which ought to have a sliding board at the bottom to allow the contents to be discharged when ready. The vessel may be filled with water, though this is not necessary in the case of succulent roots, as the potato, because the steam is quickly condensed. But when corn is to be boiled, it should be covered with water, that the steam may be condensed.

The above figure represents a *steaming apparatus* of a sufficiently good construction. A, is a barrel or other vessel for containing water and supplying it to the boiler C. D is a safety-valve. At the upper part of the boiler at C, are placed two tubes, with stop-cocks. One of these tubes terminates near the bottom of the boiler. Upon the stop-cock being turned, water should always issue from this tube. When, therefore, steam issues from it, and not water, this indicates that the water is too much boiled away, and consequently that there is a deficiency of water in the boiler. The other tube terminates within the boiler near the top. Upon the stop-cock being turned, therefore, steam ought always to issue forth. But should water in place of steam come out, then it will appear that the boiler is too full of water. In this manner, the attendant by turning either stop-cock, ascertains whether there is a deficiency or excess of water in the boiler.

The quantity of water could indeed be regulated by nicer means; but that described will be found sufficient in practice. F is the furnace, and E is a pipe with stop-cock, communicating with the boiler. When it is wished to obtain hot water, it is obtained by this pipe. A pipe G, communicates with the barrels H, I, K, and conveys the steam to them; and in these is placed the food to be steamed. By means of the stop-cocks, T, T, T, the communication can be cut off with any of the barrels, so that the steam may be admitted to one barrel or two barrels, or three, as may be intended. Each barrel has a moveable lid, which is kept down by screws, and a sliding board below, by which the food, when ready, is withdrawn, so that a wheelbarrow or vat may be placed below, and the food at once emptied into it. By means of an apparatus of this kind, roots and other parts of plants may be steamed in a convenient and economical manner.



A, Boiler. B, Furnace. C, Funnel.
D, Steam-pipes. E, Steamer. F, Rack.
G, Doors. H, Trap. I, Waste-pipe.
K, Receiving-tub.

The preceding figure represents an ordinary steam apparatus; may be put up for a mere trifle, and food sufficient for twelve to twenty horses, be got ready in a very short space of time, and with but little fuel. If it is not deemed advisable to erect the apparatus for this particular purpose, the copper, commonly placed in the corner of almost every work-house, may be replaced by an iron boiler, and used in the following manner.

In the top there are two holes, one for receiving a funnel to supply the boiler with water, and the other for admitting the neck of a leaden pipe, which conveys the vapour to the steamer; the funnel is furnished with a steam-tight plug, and the boiler should be kept about two-thirds full. Adjoining the boiler, a strongly rivetted box, of sufficient dimensions to contain the intended quantity of food, is placed upon a frame of equal height with the top of the boiler, from which the steam-pipe passes into it a few inches above the bottom, and just under a rack of laths, made strong enough to support the food, which is to be placed upon it, and close enough to prevent its falling through the intervals. The front of the box opens by either sliding or falling doors, sufficiently large to allow the food being put in and taken out, and sufficiently tight to prevent the escape of the steam; and in the top there is a small but heavy trap-door, the weight of which keeps it down, unless the pressure of the steam be too great, in which case it is forced open, and allowing a portion of the steam to pass, thus acts as a safety-valve. The steam penetrates through the rack into the whole mass of materials in the box, and, when condensed, drains down again, as water, with the oozings of the vegetables, upon the bottom, from which it is conveyed away by a waste-pipe communicating with the boiler. In placing the food care should be taken to put the roots at the bottom, and those articles which lie closer,—such as hay, straw, bran, or chaff,—at the top, so as to allow a free passage upwards for the steam. A large basket may be placed underneath the box, into which the food may be raked when ready; or a tub, with a cock at the bottom, to let off water, may be used both for that purpose, and for washing the roots previously to their being steamed. The interior of the box may be divided by sliding partitions, reaching as far down as the rack, for the convenience of separating the different kinds of foods, if that should be thought necessary: the steam-pipe may also be made to pass along its whole length, and being perforated with small holes, will thus distribute the vapour equally.

There is no occasion for the box being so large as to prepare all that may be required at one time, as a very large portion of different materials may all be steamed within an hour. The annexed figure will fully explain the plan of the machine, the whole cost of which would probably not exceed forty dollars.

There are many very simple and cheap contrivances for cooking and steaming food for stock—some of them answer exceedingly well. The simpler this kind of apparatus, the better. Convenience and economy should be consulted.

JACOB FRANTZ, Jun., Esq., of Lancaster county, has invented a cheap and most valuable apparatus, calculated for the common farmer, to feed from forty to fifty hogs, and steam and scald the feed for ten to fifteen head of cattle at the same time. It answers the purpose admirably, is cheap, and may be easily erected on any farm. A full description, with a cut, may be found on page 268 of the second volume of the Farmer's Cabinet.

PRUNING CHISELS AND SAWS.

The Pruning Knife and Saw are very useful implements. If fruit and ornamental trees are suffered to run to wood, they will yield less fruit and of an inferior quality.

Budding and Pruning Knives of a great variety of forms and shapes.

Tree Scrapers should be used every season in removing the dry and hard bark from trees to insure a vigorous growth, and keep them in full bearing.

FRUIT GATHERERS.

A very useful article for gathering all kinds of fruit, particularly for those who wish to gather choice fruit without bruising.

XIX.—PLANTS CULTIVATED FOR THEIR USES IN DOMESTIC ECONOMY AND THE ARTS.

The plants cultivated for their uses in domestic economy and the arts, constitute a very numerous class. They often yield large returns by way of profit; but they are rarely cultivated in fields, and for the most part they fall more legitimately within the province of the gardener than the farmer. We shall, however, notice in this place, such plants only of this order as may be raised by the farmer to a profit.

FULLER'S OR CLOTHIER'S TEASEL—*DIPSACUS FULLONUM.*

This plant is a native of Europe, and is cultivated with eminent success in Germany, and also in various districts in England. It is an herbaceous biennial, growing from four to six feet high, prickly and rough in the stem and leaves, terminated by the large head which is used in the manufacturing process for raising the nap on woollen cloths, which is done by the crooked awns of the head, for which purpose they are fixed to the circumference of a broad wheel, which is turned round while the cloth is pressed against them. Many ingenious and scientific men have attempted substitutes in machinery made of steel; but there is a natural elasticity about the vegetable that cannot be imparted to the steel; the latter, it is said, even when made in the most perfect manner, is liable to tear and otherwise injure or damage the cloth.

The teasels held in the highest estimation are raised in Germany, in some parts of which great pains are taken in their culture—those raised in England and many parts of Europe, being of an inferior character, command a less price—yet they are not unfrequently imported into this country as the German teasel. We have it in our power, to put an end, at once and forever, to this species of imposition; and by a very simple process, that of cultivating the teasel and supplying our own manufactories. Our soil and climate is admirably adapted to its culture, and all that is necessary, we conceive, to produce an article equal to the German teasel, is the obtaining of true seed, and proper care in its culture and preparation. We have been shewn some teasels raised in Connecticut, as fine, beautiful, plump and large, as the best of the imported, and they were pronounced by an eminent manufacturer as equal, in every respect, to the best German. This gentleman had tested them, and his declaration was founded on that test. I enquired why he did not use native teasels wholly; his reply was, "We cannot safely rely upon our farmers for a *regular* supply—some are inattentive to the culture and bring in an inferior article, and receive a corresponding price, become dissatisfied, and give it up. Others, who by proper attention, and there are but few of this class, raise a prime article, receive an excellent return for their labour, outlay, &c.; but these are too limited to depend upon or to supply the demand, which is frequently fluctuating as well as the price."

In the Agricultural Survey of Berkshire county, Massachusetts, the Commissioner states, "that of other crops raised in this country, the one that principally deserves attention, because the cultivation is not much known, is the *Fuller's Teasel.* In some few places it has been cultivated with eminent success. We believe, that considerable attention is paid to its cultivation in Vermont, and small parcels have been raised in Pennsylvania east of the Susquehanna, but its culture has no where in the middle states been systematically introduced. Mr. Colman, in his notice of the cultivation of the teasel in Berkshire county, says:*

I have the estimates of three farmers familiar with the cultivation, whose estimates of the yield of an acre will be found to differ considerably from each other. This may arise from a difference in the cultivation, or in the assorting of the several qualities; perhaps the one includes more what he deems marketable than the other. Of the farmer who reported the smallest amount, I only say that his crop was beautiful, and his teasels all assorted with the greatest care, being done up in separate bunches with neatness, and hung up separately to be dried. He reports eighty-five thousand to an acre. Another reports from two to three hundred thousand. A third, two hundred and fifty thousand; and states, that on three acres, he, in one instance, obtained a crop of one million. In one instance thirty thousand were raised on one-sixth of an acre—that is, at the rate of four hundred and fifty thousand per acre. The bur must be one inch and a half in length in order to be merchantable. The manufacturer will buy those which are shorter, but at an inferior price. The English divide them into three qualities, viz: kings, middlings, scrubs. The latter are sold at a low rate.

They are a crop which requires two years to come to maturity—and they are liable to be killed by the winter. The soil should be a deep, rich, moist loam. The cultivation should be as careful and thorough as for any garden crop. The English speak of a clayey soil as being most favourable to this crop, and advise against high manuring. Our own cultivators are of a different opinion, and say that the ground cannot be made too rich. [In this they coincide with the most experienced cultivators in Germany.] The crops with us are as large as the English crops—but our cultivators often raise a crop of carrots between the rows of teasels.

The plants are sowed in rows eighteen inches apart, and they are subsequently thinned to the distance of four inches in the row. They are to be kept as clean as possible, and in the spring every other row is to be taken up, and

* Second Report of the Agriculture of Massachusetts, by Rev. Henry Colman, Commissioner for the Agricultural Survey of the State—*Berkshire county.* This is an interesting and important document.

the plants left a foot apart in the row—those which are taken up may be transplanted; but the transplanted roots are never so productive as those which remain where they are sown. [We cannot find it recommended in any of our foreign works, to take up every other row, &c.; and on enquiry of several intelligent Germans who were acquainted somewhat with the culture of teasels, we learn that such is not the practice in Germany. We presume it is original in American practice, but what benefit arises from it is not stated, and we cannot conceive.]

Teasels are considered very good when they yield twenty burs to a stalk—fifteen is considered a good crop. A careful farmer in Berkshire county often gets fifty—but his cultivation is very skilful. They are to be gathered soon after the blossoms fall, and while green, excepting what are reserved for seed. An industrious man will cut six thousand per day—ten thousand are sometimes cut, but it is an extraordinary day's work. [We should think some of the work rather slovenly done.]

Teasels are liable to be killed by winter, or rather by thawing and freezing in the spring; particularly from snow water freezing in the heart of the plant. The snow, therefore, in the spring, is to be carefully cleared away from the plant. The plants require to be protected in the winter by a covering of hemlock branches—straw is often used, but it is apt to become a harbour for mice, which destroy the plants. A farmer in Stockbridge recommends scattering some grain among the plants, to divert the worm from the teasel. At a dollar and fifty cents, (the present price,) per thousand, under good cultivation, they will afford a fair compensation. The best article can be raised at as little expense as an inferior plant, and the value of it in the market is much greater. It is to be said in favour of this crop, that the high manuring and clean cultivation which it requires, makes it an excellent preparation for wheat. The crop, if well cured and managed, is of a durable character—and the farmer, therefore, need not sacrifice his product through any unfavourable fluctuations in the market.

An experienced manufacturer says, that for a woollen factory, the teeth must be full and strong—the colour *green-yellow*. When yellow, it indicates the teasel has been cut too late. If quite green, it is not good, as the teeth run all one way, and do not come back, not having had sufficient sun. If too yellow, they are too ripe, and their strength is generally lost.

The teasel crop, in ordinary seasons, proper attention and a fair market, is about as valuable as any grown by the farmer. A correspondent for the "Silk Grower," the correctness of whose statement I learn has been guaranteed by the editor, describes his mode of culture as below, and gives data as to the profits of his crop. Make a deduction of one-half, and the result will be such as to satisfy any man of reasonable desires.

The soil should be rich, not sandy, but loamy. I begin to sow in the spring, *not* expecting a crop till a year from next fall. In order that I may have an *annual crop*, I adopt the following method: Sow two rows about sixteen inches apart, leaving the plants about twelve inches apart—if too thick, I transplant them next spring. I then leave a space of four feet for the next year's crop, which is manured by means of a hand-cart. I hoe the plants well two or three times. The same piece of land, if well cultivated, will bear a good crop for several years. To make it still more profitable, I sow English turnip seed on the vacant parts. In this way I raise about two hundred bushels of good turnips [to the acre]. It does not cost any more to raise teasels than it does corn. There is no danger of the frost injuring them. I raise from one hundred and fifty thousand to two hundred thousand to the acre. This year they are worth a dollar and a half per thousand—some seasons they command three dollars.

I raised two acres of them this year. At the present prices the profit per acre is from two hundred and fifty to three hundred dollars. When they command three dollars per thousand, the profit is from four hundred and fifty to six hundred dollars.

In those counties in England in which the finest and best teasels are raised, the sowing season commences about the beginning of April. The English mode of sowing is broadcast, though the plant is evidently better adapted to the drill or row system. The quantity of seed varies according to the method adopted, from one to two pecks per acre; and in quality the seed should be fresh and plump. In taking the teasel crop the heads are cut off as they become ripe; but the work is mostly performed at three different periods, with intervals of about ten days between each. A knife with a short blade and a string attached to the haft, is used for the purpose. A pair of stout strong gloves is also necessary. The operator then cuts off the ripe heads with about nine inches of stem, and ties them up in handfuls, with a perfectly ripened stem. In the evening they are to be placed in a dry shed, and afterwards, when the weather is fair and the air clear, they should be exposed to the influence of the sun, until they become dry. After this, they may be put away into a dry room, where they are to remain until wanted for use. But previously to being taken to market they should be sorted into three classes, and done up with care and neatness.

To save seeds leave a few of the finest and best plants uncropped, and then, when the seed is ripe, cut off only the largest and terminating heads, from which the seed may be separated by the flail, and cleansed by the sieve or winnowing machine. The chief enemies of the teasel are the fly and the slug—their injuries are inflicted on the plant while it is young.

BLACK AND WHITE MUSTARD—*SINAPIS NIGRA ET ALBA.*

As we have remarked in another place, the Black and White Mustard are plants not unfrequently cultivated for their oils. They are likewise applicable to other purposes, and in an especial degree to the making of the well known condiment—mustard—which is much used in many countries. Both these species are annual; admit of easy culture, and ripen their seeds early in autumn. For spring or summer consumption, it is recommended to sow at intervals of a week or ten days in March and April. They may be sown in rows on a flat surface like grain, the distance between the rows being twelve inches, so as to allow a space sufficient for a person to work between the rows with a hand-hoe to advantage. They require no further culture than weeding during their growth.

When reaped, they are bound in bunches, left out a few days to wither, if the weather proves fair, and are then stacked (under cover) to remain until they are required for use.

It is the *Black* species, *Sinapis nigra,* a much larger plant, with darker leaves, and their divisions blunter than the white, which is chiefly cultivated and ground into flour for mustard; although the white, which is less pungent, is often mixed with it. By some manufacturers, both are mixed with the wild mustard and the wild radish—but the adulteration is not otherwise hurtful than as it is a fraud upon the consumer. But no American farmer need suffer in this way—if he does, it is his own fault, as he can, without expense worth naming, produce a better and purer article than the best of the imported. The *White* mustard is used in salads along with cress or pepper-grass. It is cultivated in the same way as the black; that is, it should be sown in rows, a foot or more apart, in the spring, and the plants thinned so as to stand four or five inches from each other in the rows.

Why should any man that has a garden *buy* mustard? Why should he want foreigners to send him out, in a bottle, and sell him for a quarter of a dollar, less and worse mustard than he can raise in his garden for a penny? Imported mustard is, in general, a thing fabricated—a composition of baked bones reduced to powder—some wheat flour—some colouring—and a drug of some sort to give the pungent taste. Whoever uses it freely, will find a burning inside long after he has swallowed it. Why should any man, who has a small piece of ground, buy this poisonous stuff? The native mustard seed, ground in a little mustard mill, is what he ought to use. He will have bran and all, and it will not look yellow like most of the imported—but we do not object to rye-bread on account of its colour. Ten pounds of seed will grow upon a perch of ground—and ten pounds of mustard is more than a family will consume in a year. The plants do not occupy the ground more than fourteen weeks, and may be followed by another crop of any plant, and even of mustard if you like. This, therefore, is a very useful plant, and ought to be cultivated by farmers, and by every man who has a garden.—COBBETT.

Several species of plants are cultivated chiefly for the aromatic flavour of their seeds. Of these, Coriander and Caraway may be mentioned in this place.

THE CORIANDER.

The Coriander, *Coriandrum sativum,* is a small rooted annual plant, with branchy stems, rising from twelve to eighteen inches in height. It is supposed to be a native of the south of Europe; but it is now naturalized in some parts of the United States. Its leaves and seed-vessels are strongly scented. Its seeds, which have a strong aromatic taste, are extensively used by druggists and by confectioners, and by many persons as seasoning for soups, &c. It may be sown broadcast or in rows; the latter method we should prefer. If sown in spring on a light rich soil, it will ripen its seeds the same year; but the common practice in Europe is to sow in September, when it is ready to gather early in the following autumn. Twenty pounds of seed are sufficient for an acre. When the plants come up thin them, so that they will stand five or six inches distance from each other in the drills, and the drills should be a foot apart. Stir the soil with a pronged hoe. The plants may be cut by women or children, as it is very light work. Each operator should be provided with a bag into which the plant is to be put as soon as cut, to prevent waste of seed, and thus carried to a convenient place of deposite.

CARAWAY.

The Caraway, *Carum carui*, is of the same class of plants as the coriander, with respect to its uses; but it is a biennial plant, and is frequently, in those countries where it is extensively cultivated, sown with grain; the grain being reaped the first year, and the caraway the second. It has a taper root like a parsnep, but much smaller, and running deep into the ground. The stems rise from eighteen inches to two feet, with spreading branches and finely cut deep green leaves. The seeds of the caraway are imported in large quantities from Holland and other foreign parts; for this there is no necessity whatever, as it is adapted to our climate and admits of easy culture. The yield of seed on an acre of very rich old ley frequently exceeds a ton.

THE SMOOTH LIQUORICE.

The Liquorice, *Glycyrrhiza glàbra*, is a leguminous plant, the roots of which yield a sweet and mucilaginous substance, which is employed for medicine and various other purposes. For centuries past it has been cultivated in Spain, and successfully in some parts of England, since the reign of ELIZABETH. As liquorice is in great demand, its culture might be profitably introduced among us. It requires a light soil, deeply dug, and well prepared. LOUDON says, "the soil should be a deep sandy loam, trenched by the spade or plough, or by the aid of both, to two feet and a half or three in depth, and manured if necessary." The plants are cultivated from sets, in rows, three feet distant. They are tilled by the cultivator and hand-hoe, and after three summers' growth the roots are taken up for use. The extract from the root (sold in the shops) is usually imported from Spain in rolls or cakes.

LAVENDER.

Lavender, *Lavandula spica*, is a dwarf odoriferous shrub, cultivated chiefly for the odour of its flowers, which is obtained by distillation. It yields an oil, which is employed in some of the arts. It is a perennial plant and easily cultivated. It may be propagated from seed; but slips taken off in the spring, and planted in good moist ground in the shade, are generally preferred by cultivators. When planted out, it should be in rows, three feet apart, and two feet distant in the rows, and kept free of weeds. If seed be used, sow in a garden in spring, and the plants may be transplanted in the following fall or spring. In the second season they will yield a few flowers—the fourth year a full crop—after which they will continue productive from five to seven years.

Various other species of the mint family, as *Sage*, *Marjoram*, *Thyme*, *Wormwood*, *Savory*, and *Peppermint*, valued on account of their tonic or aromatic properties, are cultivated in the same manner and for similar purposes. Being usually smaller plants they should be planted closer; but to have much flavour, the soil must be dry and calcareous. The mints are in general creeping rooted perennials.

CHAMOMILE.

Chamomile, *Anthemis nobilis*, familiar to all as a medicinal herb of great value, is a creeping perennial. It only requires to be planted on a poor soil. It may be propagated from seeds; but the parting of the roots is considered the best method. The *flowers* are used in medicine, and find mostly a ready sale in the shops. They should be gathered before they begin to fade, and dried in a gentle sun or in the shade, and then put by in paper bags, in a dry place, for use or for sale.

WEEDS OF AGRICULTURE.

The *plants* described in the preceding pages are those which form the subject of general cultivation. The *weeds* of agriculture are those which grow amongst the cultivated plants, and which it is the province and the duty of the farmer to destroy, and if possible to exterminate. The prevailing plants of this class vary in every country, and in different parts of the same country; and, indeed, the same observation may apply to the different counties.—Low.

Weeds may be divided into two separate or general classes —those which propagate themselves by their seeds, and which, having once flowered, perish—and those which have perennial roots, and flower and bear seeds for successive years, like that vile pest, the Canada thistle. The first are annual or biennial, according as they require one or two years to complete the period of their vegetation. The second are perennial plants, and grow again from the roots, as well as propagate themselves from their seeds.—*Ib.*

In the case of annual or biennial weeds, if the stem is destroyed at the time of flowering, or just before it, the individual is destroyed, and its further means to propagate the species are taken away; but in the case of perennial weeds, the destruction of the stem does not infer the destruction of the plant, because the plant has the power of propagation from the roots. From this distinction it would seem more easy to destroy annual than perennial weeds; yet this conclusion does not always hold, for some of the annual species have such numerous minute seeds, that it is often very difficult to extirpate them; and when they have got into ground, keep possession, even more inveterately than those which have the power of springing again from their roots.—*Ib.*

Of the perennial weeds, greatly the most troublesome are those which have creeping roots; for these extend themselves below ground, and, if any of the parts of the roots remain, those may give birth to new plants. Either class of weeds may be frequently destroyed by the same means, namely, by assiduous tillage of the ground.—*Ib.*

XX.—ORCHARDS.

The formation of orchards, says Lawson, are to be considered among the permanent improvements of a farm, and should be kept in view in its first arrangement and laying out. Indeed, no farm can be considered as complete without an orchard. An orchard should be of moderate size, that is, proportioned to the size of the estate—the objects to which its produce is to be applied, &c. The planting and care of orchards has been too much neglected in our country, which, from its climate, soil, &c. is admirably adapted for all varieties. Orchards may be considered in reference to soil and situation, the kinds of trees, planting, culture, and the manufacture and disposal of the products. The Farmer's Assistant says that the most suitable soil, for almost every kind of tree grown in the orchard, is that which is warm, dry, and fertile. Even light sandy lands are better for the purpose than stiff clays. It is most advisable to make use of hilly or uneven grounds, if the soil be suitable, and let those that are level be reserved for the plough.

The following excellent article, which appears to have been prepared by the Editor of the Practical Farmer from the very best authorities, we take much pleasure in incorporating in this volume, as affording all, or nearly all, the information necessary on a subject of great interest.

The most desirable aspect, is unquestionably a somewhat elevated and naturally sheltered declivity, open to the south and south-east. But orchards are now found "in every aspect, and on soil of every quality, and under every culture." Although the most approved site is that which is open to the south-east, and sheltered in other points, but particularly that opposite, yet much depends upon the character of the winds of a country. When the violence of a west wind is broken by an intervening rise of ground, a south-west aspect has been found equal to any.

Planting and cultivation.—The first thing to be determined upon, in the planting of an orchard, is the proper distance of the trees; if a mere fruit plantation be the object, the distance may be small; if the cultivation of grain and grass be in view, the space between the trees must be wider; at thirty feet apart, an acre will contain forty-eight trees; at thirty-five feet, thirty-five trees; at forty feet, twenty-seven trees; and at fifty feet, about eighteen to the acre: these are the usual distances, which may be adopted according to the character and depth of the soil. As far as can conveniently be done, trees of the smallest growth may be planted on the lightest soil; and taking every circumstance into consideration, it will probably be found that forty feet is the most eligible distance for a farm orchard. It will admit sufficient sun and air, in our dry and warm climate; and until the trees shall be fully grown, will allow of a profitable application of the ground to the cultivation of grain and grasses.

Manner and time of planting.—Much trouble will be saved, and much accuracy in planting insured, by marking the sites of trees by stakes, previous to digging the holes. In shallow soils, the holes may be made to the depth of two spits of earth, scattering the lower spit at some distance, and supplying its place by an equal quantity of the neighbouring surface earth. The depth of the hole must depend on that of the subsoil.

An eligible mode for the lighter soils, which has been practised with much success, is to supply the place of the stratum of poor earth by one or two loads of meadow mud, ditch banks, or good surface soil, laid round each tree after planting, and ploughing the ground for a fallow crop the next spring, when the mud has become completely pulverized by the frost. The size of the hole should be sufficient to admit a spade handle when laid horizontally in the bottom, affording ample room for the expansion of the roots in loose rich earth. Well digested compost is useful round newly planted trees, in stiff or cold soils. Both lime and fresh stable manure have been found prejudicial in the dry and hot weather of summer. The latter substance is too frequently a cover for moles and field mice, which are extremely injurious in winter to trees of even six or eight years old, in light soils. Every kind of manure on the surface, gradually mixing it with the soil by cultivation, has been found beneficial, and the best security against drought in summer and vermin in winter.

The proper season for planting will be found to depend on a variety of circumstances. In light soils, the winter settles the earth round the roots, and best secures them against the drought the following season. It is a time of leisure to the farmer, and affords an early selection of trees from the nursery. In stiff or wet soils, spring planting, other circumstances being equal, is to be preferred. But where proper care and attention is bestowed, success may follow in both cases. In whatever season an orchard may be planted, too much attention cannot be given to extend the roots in every direction; to cut off all wounded parts, and more especially not to plant too deep. This is the common error of inexperienced planters. As a general rule, trees should be planted in the orchard with about three inches of earth over the upper tier of roots, which will make it about two inches deeper than it stood in the nursery. The trees after being partially covered, should be well shaken, to admit the finer particles of earth among the fibrous roots, and be well settled by treading the earth around it.

The tops of young trees should never be shortened, lest it produce a growth of suckers. They may be thinned if found too heavy. If the trees have been long out of ground, and the roots have become shrivelled at the time of planting, the labour of pouring a pailful of water round each tree, will be amply repaid in the success it will insure in their growth.

Cultivation of the ground.—The looser the ground is kept for the first, and indeed for several succeeding years, the more certain and more vigorous will be the growth of the orchard. Every stage of cultivation is strongly marked in the luxuriance and colour of the foliage of contiguous plantations. Those orchards which have been two years under cultivation, exhibit a striking superiority over those which have been but one year under the plough; while these in their turn surpass the fields in clover or in grain, both in the quantity and size of the fruit. When clover is sown in young orchards, it will be well to dig the earth for about three feet, at the root of each tree. A man will dig round 100 trees in a day; the trifling loss of grass and labour will be fully remunerated by the improved vigour of the tree. When the ground can be spared from cropping, four or five furrows on each side of a row will be found a most eligible mode of promoting the growth of a young orchard.

All fallow crops are most favourable to the growth of orchards, at every early stage of their cultivation. Indian corn, potatoes, and vines, are preferable to oats or barley; and these again are more favourable than winter grain. Buckwheat is among the most beneficial crops for the promotion of the autumnal growth of trees. Clover is by many farmers believed to be injurious to young trees. Its tendency to check the growth of trees, will be found to be in proportion to the air and moisture, which its greater or less vigorous growth may keep from the roots. Light and heat appear to be as necessary to the roots, as to the branches of trees. Clover, while it occupies the ground, must prevent cultivation, and may so far be found pernicious, but probably not in a greater degree, than any other luxuriant and deeply rooted grass, absorbing the moisture, and exhausting the strength of the soil, which covers the roots of small trees.

In the arrangement of an orchard, both convenience and beauty will result from planting each kind of trees in distinct contiguous rows. Some cultivators pay particular attention to continue in the orchard the aspect the tree maintained in the nursery. Mr. Coxe says, I have sometimes adopted the practice, without much confidence in its efficacy; nor can I think it probable that trees growing in close rows in the nursery, not much exposed, can by any habit so limited in its duration, be affected by any permanent contraction or rigidity of the bark or sap vessels, which are the only effects I have ever ascribed to the influence of aspect on the stems of young trees.

The prevalent winds of our climate are from north-west. In light soils their violence will sometimes give an inclination to newly planted trees to the south-east. This may easily be remedied by setting up the trees while young, and when they have attained a large growth, it may be overcome in a great degree by cutting off the leaning branches, and by freely pruning the leeward side of the tree. But this may be prevented in the beginning by fixing short poles or stakes, and tying the tree to them.

Moss is a plant produced by poverty and neglect; it is very prejudicial to trees, and should be carefully removed. This can be readily done by rubbing the trees in damp weather with a bone or the back of a knife. A good cultivator will generally prevent the growth of moss. Whitewashing the stem not only cleanses the tree of moss, but destroys many kinds of lice injurious to fruit trees. It is followed by a cleanliness in the bark, after it has been dissolved by the rain, and promotes the health and vigour of the tree whenever applied.

The Nursery.—It has been said, and we think with much good sense, that "every farmer ought to raise his own trees," because, besides the risk, inconvenience, and expense of bringing our plants from abroad, we have, in pursuing that mode of supply, to encounter the mistakes and the ill consequences which follow a want of analogy between the soil in which the plants were raised, and that to which they are to be transferred. The first step, therefore, towards obtaining a good orchard, is to create a good *nursery*. The situation most favourable for this, is a piece of level ground, defended from cold and violent winds either by natural or artificial means, and which in composition is neither wet nor dry, and of only middling fertility. This condition of the soil is a circumstance of much importance, and ought to be rigorously observed; because the vessels of young trees, growing in rich soils, take a size proportioned to the quantity of sap they receive and circulate, and if their situation be changed for the worse, the quantity of the sap being necessarily diminished, the vessels become rigid and unhealthy, and unable to carry to the extremity of the branches the nourishment required by them. The ground (selected on these principles) must be securely fenced, thoroughly ploughed and harrowed, freed from stones and the roots of perennial plants, and then thrown up into three or four feet ridges, on which you will sow and cover your apple and pear seed, and plant your cherry and peach stones. It will now be useful to roll the beds, for the purpose of bringing the soil and the seeds every where into contact; after which they may be covered with clean straw for the winter. In the spring, your young apple and pear trees will show themselves, and after them your cherries and peaches. The treatment to all will be the same: they must be thinned to the distance of fifteen or twenty inches from each other, kept perfectly free from weeds, and if the weather be hot or dry, occasionally watered. They require only a repetition of this process, with the addition of a little careful pruning, till they have attained the height of seven or eight feet, when they are fit for grafting. It is generally known that by this operation we continue any given species of fruit; but a fact with which the public is less acquainted is, that if the graft be also grafted, the product is improved in quantity and quality; and it is to be presumed, will continue to improve, under every new and similar operation. Grafts to be well chosen, should be taken from the wood of the present year, from young and healthy races, and accommodated to the future use of the fruit. As we but speak of grafting in this place incidentally, it will not be expected that we should go into a dissertation upon that art, nor to elucidate the many divisions and subdivisions, which technical men have made of it. It is enough for us to say, that of all these different modes the *scion* and the *slit* is the simplest and the best. When your grafts have acquired some inches in length, it may be well to rub off all the buds which have pushed below them on the stem, and perhaps a few of those which have appeared above them; and if the grafts themselves put out any lateral shoots, spare them until the succeeding year, when you are called to re-graft such as have failed, and to furnish props to those which are feeble, or crooked, or ill-directed.

The year after planting, and in the month of February, when there is no circulation of sap, you will do well to begin to give the heads of your young trees that form which you wish them ultimately to take. The more circular you make them the better, always taking care to lop off those branches which do already or may hereafter, cross others having a proper direction. This proper direction will be generally horizontal, but with a slight curve; an opinion requiring perhaps a little explanation. All straight branches produce what are usually termed gourmands, or gluttons, giving little if any fruit themselves, and exceedingly exhausting to the tree. Curved branches on the other hand, rarely produce gourmands; and when the season is favourable, give much fruit. The observation of these facts, made long since, and probably growing out of the management of espaliers, first suggested the practice of bending straight branches by artificial means. The effect entirely justified the theory: these straight and barren branches, bent into nearly half a circle, changed their character with their shape, and became very productive. But there is a time for this, as for all other things, and unless the experiment be begun about the first of July, and continued to September, it will fail; because it is only within that period that fruit buds are formed.

As your trees advance in age they will require *pruning*. Suckers must be removed, and dead and dying limbs taken off. For this purpose a hand-saw, a chisel, a mallet, and a gardener's knife are the instruments to be used; all others must be proscribed, and particularly the axe, which, in the hands of folly and ignorance, has been so mischievous to fruit trees. Wounds, if large, should always be covered from drying winds, from moisture, and even from air. In gummy trees, as the peach or the cherry, this precaution is indispensable, and the neglect of it a disgrace, since the best covering is that composed by cow dung and clay—materials costing nothing and always at hand.

On this subject one other rule may be given, and that is to open the ground about the roots of the trees in the fall, to the influences of the air, rain, and frost. The last of these besides promoting vegetation, destroys many insects in the chrysalis state, which, if left undisturbed, would in the spring be very injurious. Another part of the same rule is to cover with straw in the spring the ground you make bare in the fall; the object of which is to prevent evaporation by interrupting the rays of the sun, and thus securing to the roots the moisture necessary to their welfare.

Grafting and Inoculating.—Grafting is a mode of propagating varieties of fruit of esteemed quality. Grafts may be cut at any time after the fall of the leaf in autumn, and before the buds begin to swell in the spring. They should be of the preceding year's growth, and are best from bearing trees and exterior limbs. They may be preserved by imbedding their larger ends in clay, a potato, or in moist earth, in a cellar in winter, or in the open ground, partially or wholly covered, in the spring.—Grafts are frequently sent across the Atlantic.

The great care should be, that they are not kept too warm or too moist, so that the buds swell before they are wanted for use. The rationale of grafting will suggest the time and the manner in which it should be done. The scion and graft are to be so adjusted that the sap wood of the stock, by which the sap ascends from the roots, comes in contact with the sap wood of the scion; and a like adjustment must be observed between the inner bark of both through which the sap descends from the graft to the stock, after it has been elaborated in the leaves. Without the first precaution, the sap will not reach the graft, which will consequently shrivel and die. Without the last, the graft cannot knit or unite to the stock; for it is the descending sap which forms the new wood, and which indeed causes the graft to send its roots down into the earth, upon the outside of the wood, but under the bark of the stock. The union can only take place after the sap has begun to circulate in the stock, which is when the buds are bursting. The clay or composition is applied to exclude the drying influence of the air and sun, and also rain, from the wound, until a complete union has taken place. The graft does not become injured by being somewhat shrivelled before it is inserted; but if it appears too much so, it may be buried a few hours in moist earth before used. The compositions used as substitutes for clay are many. A good one is, one part tallow, two parts beeswax, and four parts rosin, melted and incorporated like shoemaker's wax. If the weather is cold this will require to be softened by immersing it a time in warm water. A thin layer of this, covering the end of the stock and the slit, will suffice. With the addition of a little more tallow, the composition may be spread upon linen or cotton cloth, when warm, and the cloth cut to the required size for a graft, and applied with less trouble in the form of a prepared plaster. The different processes of grafting are so generally known, that we need not detail them; our object being only to throw out such suggestions as may tend to render the success of operation more certain.

Transplanting.—Success in transplanting trees depends much on the treatment they receive in that operation. On removing the trees from the nursery, care should be taken to prevent the roots from lying previously to planting them, otherwise they may receive considerable injury; and when they are to be transported to a distance, particular care should be taken to preserve them from drying winds before packing. Immediately on their receipt the bundles should be unpacked, the roots well watered and "laid in" until the ground in which they are to be planted be ready to receive them. By laying in, is to be understood the making of a trench sufficiently large to admit the roots, into which they are placed; the earth having been previously made fine is then filled in around them, and a gentle watering given, in which situation they may remain with safety, until planted.

The holes in which it is intended to plant them, should, for an ordinary sized nursery tree, be from two and a half to three feet in diameter, and about the same depth; the earth from the bottom should be thrown aside, and the place filled up with good compost or black mould (no fresh stable manure should be used in the compost). The tree should be planted one or two inches deeper than it stood in the nursery, the roots and fibres being spread out horizontally, and during the process of filling in the earth, the tree should be shaken several times, so as to admit the soil between the roots, and also to fill up any cavities that might otherwise remain. The earth should then be trodden down and gently watered; in a short time it will have settled, and any hollows that may have formed, should be filled up—finishing by forming a basin around the trench to receive the rain or watering which may be necessary to give it, if the ensuing season should prove dry; to prevent the winds from loosening the earth round the roots, the tree should be secured to a stake by bands of straw.

The proper season for transplanting trees in this latitude, is from the middle of October to the first or middle of May. Trees transplanted in autumn should have the roots a little protected during the first and most trying winter. This protection may consist of a few inches of litter from the stable, placed among their trunks and over their roots. Moss from the meadows or evergreen boughs are, however, preferable for delicate plants, as these substances being almost incorruptible, never injure what they were designed to protect.

"We have observed," says the Genesee Farmer, "in regard to transplanting fruit trees, that we have rarely lost one that stood in cultivated ground, where the hoe was introduced several times in the course of the summer; but, on the contrary, where the trees were set in grassy land, or where the cultivation was neglected, our losses have been considerable. We therefore advise in order to insure the safety of such as have been planted out, either in the last autumn or this spring, to have the ground well hoed round them once a month; and if it be done every fortnight, it will be still better. The labour will not differ very materially from hoeing a hill of corn. It is worthy of notice, however, that the oftener it is done the easier it is to do—because the soil will be kept loose and mellow.

"To water trees in that condition may sometimes be useful;

but we are not free to recommend it very highly. A loamy soil that is much watered soon becomes hard; the surface is glazed, rendered in a great measure impermeable to the air, and consequently is no longer capable of affording in dry weather the necessary nourishment to the plant. The sources of its fertility are obstructed. This may be better understood to some of our readers, when we state on the authority of Sir Humphrey Davy, that a soil in the greatest degree absorbent, exposed to the atmosphere till it becomes dry to the touch, still contains moisture equal to one-eighth part of its whole weight. This is discoverable by subjecting it to a heat indicated by 300 degrees of Fahrenheit's thermometer. Now all water not chemically combined, but only *adhering* to parts of the soil, is in constant use in vegetation: and the one-eighth part referred to is of this kind. If we estimate common fertile soils, however, as containing only one-twelfth part, then in 400 pounds of soil, even when it is dry to the touch, we shall have 33 pounds of water in store for the use of vegetation; and it is particularly worthy of notice, that such soils when deprived of a portion of this by plants, procure a fresh supply *by constantly absorbing water from the atmosphere*, where it exists in the state of vapour. In effect, a good soil is a perpetual fountain, even in dry weather.

"From these statements it must be evident, that unless the ground is frequently cultivated and kept mellow, so that between its particles the air can pass in, the latter cannot impart the moisture which it holds in solution; but when the soil is freshly broken, minutely divided, and prevented from conglomerating, these invisible springs are preserved in order, and plants that drink from them will long resist the drought. Let the hoe then, be freely and frequently used."

Pruning.—The principal objects of pruning, are to procure a good bole or trunk for timber, to form a head for the protection of fruit, and to subserve the purpose of ornament.

To effect these objects with the least trouble and greatest advantage, upon all non-resinous trees, the following rules are recommended by Judge Buel.

1. Begin to prune the tree when it is young.
2. Cut close and smooth to the bole or limb.
3. Cut, when small, the branches which are likely to interfere, or become useless, and which, if suffered to remain, will require to be removed at a more advanced period of growth.
4. Do not trim to excess. Let the branches occupy *at least* a third of the entire height of a tree.
5. Do not prune when the tree bleeds. Where the preceding suggestions are observed, we may add—

6. Prune in the summer.

He then proceeds to offer his reasons for the rules here recommended:

First, The food required to nourish the lateral useless branches, will go to increase the diameter and height of the plant, or swell the fruit, if these are judiciously removed. But a main consideration is, that the excision of small branches causes only small wounds, and small wounds speedily heal. The observation of this rule, therefore, facilitates growth, promotes health, and ultimately saves labour.

Secondly, This rule needs very little argument to enforce its propriety, as every observer must have frequently seen and lamented the ruinous effects of an opposite practice. The snags either send out useless spray, or deprived of the feeble aid of these, they die and rot, and carry disease into the bole, and are thus often the cause of the premature loss of the tree. If cut close, the enlargement of the living wood soon covers the wound. In large branches, where the saw must be used, the healing process is greatly facilitated by paring the cut, particularly the exterior edges, with the pruning knife; and it is a good precaution, before you use the saw, to notch under the intended cut, to prevent tearing the bark when the limb falls. In extirpating sprouts from the roots, (and neither they nor those growing from the bole should be suffered long to remain,) the like precaution of cutting close should be observed; for which purpose it is necessary first to remove the earth from about the collar, with the spade or other instrument.

Thirdly, The reasons for pruning a tree while young, apply here: it is easier to cut small than large limbs, and the wounds of the former soon heal. But the question presents, what limbs are to be cut? Generally all that are likely to cross each other, all feeble spray, the strongest on the bole, and the weakest in the top; for while the trees are in nursery, I think it serviceable to leave a few scattering laterals upon the bole, and it is beneficial, at all ages, to thin most kinds in the top. Yet the answer to the inquiry will depend principally upon the species of tree, and the design of the planter. If his object be timber, the leading shoot should be feathered up in a spiral form, and all other shoots likely to interfere with its growth be cut away. If the object be fruit, beauty and utility are to be consulted, and these seldom are incompatible in the eyes of a fruit grower, for with him productiveness constitutes beauty. If ornament be the main consideration, no special directions can be given, as the species employed, the location, and the taste and fancy of the planter, will have a controlling influence. The rule for timber trees will not apply to either those destined for fruit or ornament.

In orchard and garden fruit, generally, the endeavour should be to obtain a low and spreading top. When a clean bole is obtained to a sufficient height, say, in the orchard, of seven or eight feet, and in the garden, according to fancy, the leading shoot should be cut in, and three or four more branches left to form the head; which, when the habit of the tree will permit it, should be pruned so as to give it a besom form, or that of a broom divested of its centre. Several advantages arise from this and a more extended form. It admits the air more freely, to mature the fruit and wood; it renders the trees less liable to be blown down; it facilitates the gathering of the fruit, and the pruning of the tree. But its principal advantage consists in its tendency to increase oviparous or fruit buds, and consequently to augment the fruit. A great growth of wood seems to be incompatible with a great crop of fruit, and vice versa. A cow that gives much milk seldom takes on much flesh during the milking season. If the secreted food is converted into milk and fruit, there can be but little reasonable hope of its adding to the flesh of the animal, or the wood of the vegetable. Erect branches produce most wood buds. Straight limbs produce less fruit than those that are curved or crooked. Whatever retards or diminishes the flow of elaborated sap, in a healthy tree, is favourable to the production of fruit. Hence wall trees, whose limbs are trained in the form of a fan, or in a horizontal direction, bear better fruit than those that grow upright as standards. Hence young trees are more apt to show blossoms the first and second year after transplanting, than in the two subsequent years. Pomologists have endeavoured to render this law in vegetation subservient to their interests, by adopting artificial means for producing the production of fruit buds. These means consist in ring-barking, transplanting, cutting the roots, training, pruning, &c. The pears in the Caledonian horticultural garden are trained *en quenouille*, that is, the lateral branches are cut in to a short distance of the main stem, and kept so, and the fruit is produced on the spurs growing from these short branches. In the horticultural garden of London, the limbs of the pear are tied down in a drooping position, resembling somewhat in appearance the weeping willow. The vines cultivated at Thomery, celebrated for their superior fruit, are planted eighteen inches apart, trained in the form of a T, the top horizontally, and restricted in their growth to four feet from the main stem. In this way a treillance of eight feet long, and eight feet high, is sufficient for five vines, which produce upon an average 320 bunches of fruit. These modes of training have a common object, that of restricting the growth of wood, and producing an increase of fruit. Those who wish to examine the modes of training here spoken of, in detail, are referred to LOUDON's Gardener's Magazine.

Fourthly, Leaves are as necessary in the economy of vegetation as roots. The sap must be elaborated in these before it can be transmuted into wood, bark, or fruit. A tree cannot thrive, therefore, when these organs are deficient or diseased.—If sufficient leaves or branches to produce them, are not left to concoct or digest the sap which is propelled from the roots, the tree, to use a modern term, but a just comparison, becomes *dyspeptic;* the vegetable blood is vitiated, the wood loses its texture, and a stunted growth or premature death generally ensues.—Hence great precautions should be used against excessive pruning.

Fifthly, To prune when the tree bleeds tends to debilitate, by wasting what is designed as food for the tree. I have known it fatal to the vine. What is called bleeding is the flowing of the sap from wounds, before it has been converted into aliment.—This sap flows most freely while the buds are swelling, and until the leaves are fully capable of discharging their office, as is strongly instanced in the maple, birch, &c. Our orchards are generally pruned in March, which is probably the most unfavourable month in the year for this operation.

Sixthly, The advantages of summer pruning are that the tree being then in vigorous growth, the wounds heal speedily; and the sap being concocted and thick, does not flow from the wounds, and thereby impair the health of the plant. Summer pruning should not be performed, however, before July, when the new growth has considerably advanced. It may be well to add, as this suggestion may seem unsound, that summer pruning is recommended by the best authorities. "As a general rule," says PONTNEY, "summer is preferable to winter pruning:" and SANG suspends pruning "from the beginning of February, to the middle of July, but carries it on during every other month of the year."

In regard to evergreens, which with us are confined principally to resinous trees, it is the general practice of nurserymen, and I think it a judicious one, not to prune them until they have acquired some years' growth, and then but sparingly, and at long intervals, displacing two or three tiers of the lower branches every two or three years. MONTEITH says, "never cut off a branch until it has begun to rot, as the bleeding of a live branch will go far to kill the tree."

The implements employed in pruning, and the manner of using them, are matters of moment. If the operation is commenced when the tree is young, and judiciously followed up, a good knife, a small saw, and a chisel fixed on a six foot handle, to trim the tops and extremities of the branches, are all the tools that are required. A large saw will be occasionally wanted; but an axe or hatchet should never be employed, as they fracture the wood, bruise and tear the bark, and disfigure the tree.

Diseases of Fruit Trees.—Fruit trees, like other productions of the vegetable kingdom, have their enemies and their diseases. All excesses of heat or cold, wetness or dryness, are unfriendly to them; sometimes wholly destroying their fertility for the season; at others seriously injuring it, and occasionally, though rarely, disorganizing the trees themselves.

Many insects also prey upon them, attacking their leaves, blossoms, fruit, bark, or roots.

But after all, may not our own negligence be considered as the most fruitful source of many others of a similar kind? We often find their bark covered and coloured with parasites, in the form of moss, lichens, and smut, which a small degree of labour and a little whitewash would entirely and promptly remove. We often see the ravages made on their leaves and fruit buds, by caterpillars of different names and appearances, when if we visited them at day-break, all would be found at home and asleep, and entirely within our reach. And lastly, we often see wounds inflicted on stems and branches (under the name of pruning), left open to the alternate action of air and frost, and sunshine, and thus occasion fatal consequences, when a cheap and simple covering (a mixture of clay and cow dung) would prevent the difficulty.

There cannot be a doubt that many of the evils above referred to, might be remedied by timely attention. Trees may be kept free from insects by washing them with soap suds before the insects have left those places where they have passed the winter, and before the eggs which were deposited under the loose bark, and beneath limbs, &c. are hatched. By early washing trees and vines, with strong soap suds, or with lime-water, not only are innumerable eggs and insects destroyed, but the young plants and seeds of many varieties of mosses which infest or injure trees and vines, are destroyed also. Trees that are annually washed, have a more healthy appearance than those that are not, when growing side by side.

The application of lime has been known to restore old and apparently worn out trees, to renewed health. A gentleman in Essex, England, having in his orchard many old supposed worn out apple trees, which produced fruit scarcely larger than a walnut, last winter took fresh made lime from the kiln, slaked it in water, and (without allowing time for its caustic quality to be injured by imbibing fixed air) well dressed the trees, applying the lime with a brush. The result was, that the insects and moss were completely destroyed, the outer rind fell off, and a new, smooth, clear one formed; and the trees, although some twenty years old, have now a most healthy appearance. The same treatment may be extended to other fruit-bearing trees, and probably with similar beneficial results.

Mr. Wheeler, of Framingham, (Mass.) recommends to wash trees with a solution of potash. He says,

"Dissolve two pounds of potash of the first quality, in seven quarts of water, for the bodies of the trees. If the limbs are covered with moss or lice, I take a painter's brush, and apply the solution to the moss, &c., with care not to touch the leaves or buds. It may be done at any time of the year when we are most at leisure. Once in two or four years is generally sufficient. I have no general rule, however, but wash them as often as they appear to need it—which is always when the bark is not smooth.

"No person need be afraid of this application injuring fruit trees; but it may be applied with the utmost confidence. I have used it for nearly twenty years with great effect. I have recommended it to a great many gentlemen, but only a few have used it. Those who have tried it, are much pleased with its operation. The reason that it has not been more generally used is, that it has been fashionable to daub the trees with lime, clay, manure, and other compositions, which take two or three years to wash off, before the trees will look natural. When this solution of potash is applied, it has the desired effect immediately. It kills moss and lice at once; and the first rain that comes washes the bark perfectly smooth, and gives it a fair, natural, healthy colour."

Caterpillars may be easily destroyed, if taken in time, and at the proper time. Early in the morning, and in wet weather, they may be found concentrated in a small compass, under their web. If within reach, the whole colony may be crushed in a moment with the hand. To reach the more elevated webs, wind the end of a pole with rags, and with this destroy them. Or, what is better, affix a Pickering brush to the end of the pole, and with this destroy them. This brush is round and conical, somewhat resembling a bottle brush. A man or boy will clear an orchard of this pest before breakfast; and the operation may be repeated, if necessary, without expense, or much loss of time. Or, in place of a brush, put a sponge or swab made of rags, on the end of a pole, saturate it with lye made from common wood ashes, or soap suds may be used instead of lye; with this preparation give their nests a thorough washing early in the morning before these mischievous animals have gone abroad for their food. This will instantly prove fatal to them. Be careful to break the web of the nest, because they are so constructed as to shed the rain and dews, the animal will thus escape. Not one of them can live a minute after being wet with this liquid.

Many methods are prescribed to protect the different kinds of fruit trees from injury by insects, worms, &c., but these will be spoken of under the head of the trees themselves.

Orchards are generally composed of Apple, Pear, Peach, and Cherry trees; though to these may be added some others.

The *Apple Tree.*—"Of the many fruit trees in cultivation," says the author of the Treatise on Agriculture (Mem. Board of Agr. N. Y.) "this may be deemed the most important; not only from the great abundance, diversified character, and numerous uses of its produce, but from the small degree of care and labour required in its culture, and the uncommon facility with which it adapts itself to a great diversity of soils, climates, and situations. One of its varieties (the crab) is a native of our own forests; but the cultivated sorts among us have all been derived from Europe."

The apple is used for the table, for cooking, and making cider. In the selection of sorts, therefore, regard will probably be had to all these objects. But these are so numerous, that not one man in a hundred, and probably not one in a thousand, says another writer, in the same work, possesses sufficient knowledge of the numerous varieties to enable him to make a judicious selection. One wishes to cultivate the summer and early autumn kinds for marketing; another more remote from towns, would confine his attention to the choice of winter varieties, or those which yield the first quality of cider, while all are desirous of planting a succession at least for domestic purposes. The synonymes are so numerous of some varieties, that they are scarcely known in two states by the same names. Our tastes are extremely variant. With some, size is every thing; with others, colour; and others again regard as material the flavour, the rarity, or the qualities for bearing, or late keeping.

The following list is from the treatise above referred to (by J. Armstrong, of Dutchess), and is designed to exhibit those sorts which stand highest in horticultural estimation, for the hardiness and productiveness of the tree, the excellence of the fruit, and the variety of uses to which they may be applied. We have identified the names (so far as we could) with those given by Kenrick, in his New American Orchardist.

For the table, for cider making, and for cooking.

Golden pippin. A good bearer, fruit fine.

Newtown pippin, good bearer, fruit fine. *Kenrick, 2 sorts, green and yellow Newtown pippin.*

Fall pippin. Great bearer, fruit fine. *Kenrick, Fall pippin.*

Elton pippin. Great bearer, fruit fine.

New scarlet pippin. Middling bearer, fruit fine.

Padley pippin. Middling bearer. *Kenrick, Padley's pippin.*

Spitzenberg. Good bearer, fruit excellent. *Kenrick, Esophus Spitzenberg.*

Swaar. Good bearer, fruit excellent. *Kenrick Swaar.*

White Calville. Great bearer, fruit fine.

Red Calville. Great bearer, fruit fine. *Kenrick, Red Calville.*

Autumn Calville. Good bearer, fruit fine. *Kenrick, Red Autumn Calville.*

Principally for cooking.

Kentish Russet. Great bearer, fruit fine. *Kenrick, Kentish Broading.*

Beauty of Wilts. Great bearer, fruit fine.

French Crab. Great bearer, fruit fine.

Hollow Eyed. Great bearer, fruit fine.

Cornwall Pearmain. Great bearer, fruit fine.

Keswick Codline. Very great bearer, fruit fine.

Dutch Codline. Great bearer, fruit fine. *Kenrick, Dutch Codline.*

For the table or cooking.

Rennet Frank. Good bearer, fruit fine. *Kenrick, Reinette Franche.*

Grey Rennet. Good bearer, fruit fine. *Kenrick, Reinette Grise.*

Golden Rennet. Good bearer, fruit fine. *Kenrick, Reinette Dore'e.*

Apple trees are liable to depredations from several quarters. Beside those formerly mentioned, with the means of their remedy, the *borer*, a worm which perforates the wood, at the surface of the earth, a little below where the bark is tender, is an enemy to be contended against. If the worms have penetrated the tree, it will be necessary of course, to pick them out; but this may be prevented by a timely application of the wash (potash) before referred to; which has been found an effectual remedy against the borer. It is said that the eggs which produce this insect are deposited from the last of April to the beginning of June (that is, during the month of May, so that the latter end of May or the beginning of June will be the proper time to make the application). Every other year will answer for this remedy, but the horticulturalist will find himself amply repaid by a more frequent application.

The Canker worm.—The female of this insect comes out of the ground very early in the spring, and ascends the tree to deposit her eggs, which she does in suitable places in the bark, where they are brought forth, and the young brood live on the leaves of the tree. Several methods for subduing them have been tried with some degree of success.

1. Tarring. This must be commenced as soon as the ground is bare of snow, (which is in some years as early as February,) that the first thawing of the ground may not happen before the trees are prepared. A strip of canvass, or linen, three inches wide, should be put round the tree, having first filled the crevices of the bark with clay mortar; draw it close and fasten the ends strong. A thumb rope of tow should be tied round the lower edge of the strip to prevent the tar from running down on the bark and injuring the tree. Let the strips be plentifully smeared with cold tar, of a proper consistence, to be put on with a brush. It must be renewed once a day without fail. The insects are so amazingly prolific, that if ever so few of them get up, a tree is ruined, at least for the ensuing season. The best time is soon after sunset, because the insects pass up in the evening, and the tar will not harden so much in the night. This work must be continued with care, generally till the last of May.

2. Mr. Nicholson recommends to scrape off the shaggy bark to the width of two or three inches; then make a mixture of oil, or blubber, with suitable proportions of sulphur and Scotch snuff; and lay this on with a brush, forming a ring an inch or two wide; and no insect will ever attempt to pass this barrier as long as the composition has any considerable moisture left in it. Let it be repeated when it inclines to harden; though perhaps this is not necessary.

3. The pasturing of swine in an orchard in the fall and spring, has been found very serviceable. These animals appear to possess a natural instinct directing to search for vermin and insects, which conceal themselves in the earth.

4. The late Mr. Peck, of Massachusetts, recommended as an effectual remedy, turning up the ground carefully in October, as far as the branches of a tree extend, to half a spade's depth, or five inches, so as completely to invest the surface. Break the clods, smooth the surface with a rake, and pass a heavy roller over it, so as to make it very hard, and without cracks. If the frost should heave and crack the smooth surface in the winter, it must be smoothed and hardened again in March. This will be found less expensive than the long course of tarring.

5. Dr. Thatcher thinks it highly probable, that a quantity of sea-weed pressed round the trunks of fruit trees, extending three or four feet, would prove a remedy, by forming a compact substance, through which the canker moth and worm would not penetrate.

6. Mr. Kenrick, of Massachusetts, proposes to destroy canker worms by the following method: from any time in June, after the worms have entirely disappeared, until the 20th of October, let the whole of the soil surrounding the trees, to the extent of four feet, be dug up and carted away to a considerable distance; and let there be returned an equal quantity of compost, or rich earth, intermixed with manure. By this operation, the farmer, besides exterminating the worms, promotes the growth and fruitfulness of his trees, and defends them against moles. The author of the Farmer's Assistant observes, that by taking the earth away from the roots of the trees very early in the spring, and destroying whatever may appear to be the abode of any insects, and then returning the earth back, mixed with a small quantity of sulphur, sprinkling some of this upon the surface, is, he believes, the most effectual method to keep every kind of insect from ascending.

7. Mr. Knapp, of Boston, has been very successful in the application of lime, as follows: Dig the turf, lay the ground smooth, and apply the lime in the fall. Take air-slaked lime,

strew it about an inch thick, to the extent of two or three feet from the roots of the trees. The digging round the trees is highly useful, while tarring is injurious. The expense is not great: a man can dig round fifty large trees in a day. The lime is a most salutary manure to the trees. After the spot has been once opened and limed, the labour of keeping it open will not be great. Three hogsheads of air-slaked lime, or sweepings of a lime store, will suffice for fifty trees, and will cost three dollars. As it is done but once a year, he thinks it cannot be half so expensive as tarring.

Mr. Ruggles, of New Haven, Conn., says he was some years ago struck with the idea that the capsules of the American chestnut, or chestnut bur, might be applied with advantage to prevent the effects of the canker-worm. We accordingly took a piece of strong twine and sail needle, and made a band of them, placing all the backs one way, which caused the spires to project in all directions. We tied this round the trunk of an apple tree, in the centre of an orchard, that was much injured the year before; the tree bore abundantly without the leaves being injured in the least, while those around were all ruined for that year.

He has since tried it several times with entire success. A set of bands will last many years, if taken off when the insects have done ascending, and secured in a dry place. He usually put the bands on the trees about the beginning of March. In places where chestnut burs are not easily obtained, he thinks the use of the fuller's teasel would answer the same purpose.

The Curculio.—The curculio is a winged insect or beetle. The manner in which it injures and destroys fruit, is by its mode of propagation. Early in the spring, about the time when the fruit trees are in blossom, the curculio ascends in swarms from the earth. They crawl up the trees, and as the fruit advances they puncture the rind or skin, and deposit their embryos in the wounds thus inflicted. The maggot thus bedded in the fruit, preys upon its pulp and juices, until in most instances the fruit perishes, falls to the ground, and the insect escaping makes a retreat into the earth, where it remains until the coming spring.

Various modes have been recommended and practised to destroy this insect or avert its attacks. One fact mentioned by Dr. Filton, renders it extremely probable that the same remedies might be effectual here, which are prescribed against the canker-worm. He says that two trees of the same kind may stand in the nearest possible neighbourhood, not to touch each other, the one have its fruit destroyed by the curculio, and the other uninjured, merely from contingent circumstances, which prevent the insects from crawling up the one while they are uninterrupted from climbing up the other.

Among the proffered remedies is that of suspending tarred shingles in various parts of the tree, the odour of which is supposed to be repugnant to them. Digging round the trees, in the manner before mentioned, has also been advised. It has, however, been observed, that those orchards are most free from their depredations to which the domestic animals have free access.—Hogs, by devouring the fruit that falls, before the insects have time to escape; and poultry, who are great devourers of all sorts of insects, will contribute greatly to this end. Therefore it is, that smooth stoned fruits in particular, succeed much better in lanes and yards, where the poultry run without restraint, than in gardens and other inclosures from which they are excluded. Horned cattle also, by trampling and hardening the ground, may be of service to the preservation of fruit. Paving the ground is said to be a very effectual mode of preserving fruit from the attack of the curculio, by preventing its descent into the earth, in which case it finds no winter habitation. But as this could not be done on a very extensive scale, some flat stones laid around the trees and cemented with lime, might be substituted.

In Kenrick's new and valuable American Orchardist, we find the following excellent remarks on

Gathering and preserving fruit.—"Various theories have been offered for preserving apples in a sound state for winter use, or for distant voyages. Some have proposed gathering the fruit before it is ripe, and drying it on floors before it is put up: this has been tried; apples lose their sprightly flavour, and keep no better than by some less troublesome modes. Dr. Noah Webster has recommended that they should be put down between layers of sand that has been dried by the heat of the summer. This is, without doubt, an excellent mode, as it excludes the air, and absorbs the moisture, and must be useful when apples are shipped to a warm climate. But apples thus preserved are liable to imbibe an earthy taste.

"Chopped straw has also been highly recommended to be placed between layers of fruit; but I have noticed that the straw, from the perspiration it imbibes, becomes musty, and may do more hurt than good. When apples are to be exported, it has been recommended that each be separately wrapped in coarse paper, in the manner oranges and lemons are put up. This is, without doubt, an excellent mode. And Mr. Loudon has recommended that apples destined for Europe should be packed between layers of grain.

"Great quantities of winter fruit are raised in the vicinity of Boston, and put up for the winter use, for the market and for exportation. The following is the mode almost universally adopted by the most experienced. And by this mode the apples, under very favourable circumstances, are frequently preserved in a sound state, or not one in fifty defective, for a period of seven or eight months. The fruit is suffered to hang on the tree to as late a period as possible in October, or till hard frosts have loosened the stalk, and they are in danger of being blown down by high winds; such as have already fallen are carefully gathered and inspected, and the best are put up for early winter use. They are carefully gathered from the tree by hand, and as carefully laid in baskets. New, tight, well seasoned flour barrels from the baker's, are usually preferred; the barrels being quite filled are gently shaken, and the head is gently pressed down to its place and secured. It is observed that this pressure never causes them to rot next the head, and is necessary, as they are never allowed to rattle in moving. No soft straw or shavings are admitted at the ends; it causes mustiness and decay. They are next carefully placed in wagons and removed on the bulge, and laid in courses in a cool airy situation, on the north side of the building, near the cellar, protected by a covering on the top of boards, so placed as to defend them from the sun and rain, while the air is not excluded at the sides. A chill does not injure them; it is no disservice; but when extreme cold weather comes on, and they are in imminent danger of being frozen, whether by night or day, they are carefully rolled into a cool, airy, dry cellar, with an opening on the north side, that the cold air may have free access—they are laid in tiers, and the cellar is in due time closed, and rendered secure from frost.—The barrels are never tumbled or placed on the head. Apples keep best when grown in dry seasons and on dry soils. If fruit is gathered late, and according to the above directions, re-packing is unnecessary; it is even ruinous, and should on no account be practised, till the barrel is opened for use. It has been fully tried."

Making cider.—From the apple, in our country, we obtain a beverage highly useful. The wines of other countries do not differ more in quality than the cider in ours. And much of this difference arises from improper management, either in grinding the apples, or, what is more common, putting the must or juice into foul casks, and neglecting or mismanaging it while fermenting.

To make the best of cider, you must have sound fruit, (no rotten apples must ever be admitted,) gathered late in the season in *dry* weather, after the middle of October if possible. They should lay in large heaps, covered from the dews and rain, about fourteen days, in which they heat, and throw off a great proportion of their indigested and insipid water, and ripen more uniformly than while on the trees. They must not be ground while they are wet either from the rain, the dew, or from the moisture thrown out by the heat produced by their laying together.

The finer the apple is ground, the more it will yield. If the mill is well fitted, it crushes the seed, and gives a peculiar aromatic bitter to the must, which becomes more and more distinguishable as the cider is longer kept. Some prefer this flavour; others dislike it, not distinguishing it from the bitter of the rotten apples, although very different from that pungent bitter, both in taste on the palate and effects on the stomach.

The pumace should be suffered to stand from six to twenty-four hours, according as you may wish to give a higher or a paler colour to your cider. Its aptness to imbibe foreign tastes renders an exact attention to your vessels of great importance. New vessels, made of seasoned oak, do very well; but those which have been used are better, provided they be kept *sweet* and clean.

How to clean the casks.—When a cask is emptied rinse it with cold water *immediately*, otherwise the lees will sour, and fix an acid that can hardly be removed; and if long continued, dries on the staves so hard as to require much labour in scrubbing it off; in this case it should be whitewashed with lime (which is done by putting about one pint of unslaked lime into a barrel of common size, to which pour three or four gallons of boiling water; shake it well, giving it vent; let it stand till cool, and rinse with cold water. If it still retains the sour smell, let the operation be repeated.)

When it is rinsed perfectly clean with cold water, pour into a hogshead at least six gallons of boiling water. Roll and shake the water to every part of the cask, so as to heat it on all sides. Then pour out the water and lay your cask exactly bung hole downwards, the water running clear and entirely off; the heat in the cask will dry it perfectly. In this state bung it up as carefully as if filled with your choicest liquors, and it will remain perfectly sweet and fit for use in the following season.

It is best, however, to inspect each cask before you fill it. This is done by fixing a candle to a wire three feet long, and letting down the candle through the bung hole into the cask; you can then see every part of the inside as distinctly as the outside. If they are clean (and tight) it is not best to rinse them with water. It may appear singular to you that so much is said on a case that is plain to every one; but believe me, you may take ten times the trouble in another way, and not effectually cleanse your vessels; and unless they are perfectly sweet, it is impossible to have good cider.

The must or juice of the apple being obtained, the first object is to clear it of pumace; the second, to produce a fermentation to your palate and purpose.

To clear the liquor of pumace, most farmers do nothing more than strain it through straw. It ought to be strained through a hair sieve, or run through sand. The mischief of pumace left in the liquor is, that it produces an *excessive fermentation,* by which more cider is injured than in any other way.

Another way to free the liquor of pumace, practised by some of our best farmers and much recommended, is putting the liquor into large open vessels or vats, with a tap and faucet near the bottom, by which to draw it off. Hogsheads, where they can be had, with one head out, will answer the purpose. In these open vessels it is to stand *till the first appearance of fermentation,* which may be sixty hours; or it will be sooner or later according to the degree of heat in the air at the time.

During this period the heaviest of the pulp sinks to the bottom; the larger and lighter parts rise to the surface in scum, where it remains until the fermentation begins; but the fermentation would involve great part of the pulp, both from above and below, into the body of the liquor, and increase the fermentation beyond our control. It must, therefore, be removed before this effect be produced. Soon after the fermentation begins, the covering on the top of the must or liquor cracks and separates, when there is not a moment to be lost before you draw it off into your casks, leaving the pulp behind.

Fermenting of cider, fining and bottling.—There are three fermentations of which cider is capable; first, the *vinous*, which produces the alchohol or spirit that gives the liquor its stimulating and exhilarating qualities; second, the *acid*, which turns the cider to vinegar; third, the *putrid*, which utterly destroys its use, and reduces it to a nauseous and poisonous liquid. The principal object in making good cider is, to stop the working of the cider as soon as the vinous fermentation is completed. The cider in our country, as it is usually managed, rarely stops at this stage. Nine times out of ten, it is far advanced to the vinegar state.

The fermentation should be slow; in order to this the medium heat of the day should never exceed forty-eight degrees of Fahrenheit's thermometer. But as farmers, generally, have no thermometers, it may be sufficient to notice, that this temperature of the air does not usually take place in our cellars before November, which generally affords the best season for making and storing cider.

To check the fermentation when becoming too violent or too long continued, rack or draw off the cider from the lees into clean casks, in which, when about half filled, should be burnt some matches of sulphur, and the fumes incorporated with the cider by shaking and turning the barrel. When the air in the cellar is fallen to forty-six degrees or lower, it is fit for the reception of cider.

During the whole time of fermentation the casks must be kept full, so that the yeast, pulp, gas, or whatever you please to call that matter which rises in fermentation, may be thrown out of the cask and not return into the liquor; for if it does, it operates as yeast, renews the fermentation, and will destroy the cider.

If racking or drawing off the cider has not been done sooner, it should never be delayed longer than till February, as if suffered to stand on the lees through the summer it will most certainly injure the cider. To fine or clarify cider, isinglass, the whites of eggs, and calves'-feet jelly, are all made use of. This, however, need not be done, unless the cider is wanted for bottling or for market, as good cider will generally fine itself, in its own time.

One ounce of isinglass, as it is called, which is nothing else than fish glue, dissolved in two or three quarts of cider, and strained, is sufficient for one barrel. This must be well mixed with the cider by a stick introduced at the bung. Leave the bung out, and it will usually fine in eight or nine days, after which, if desired, it may be drawn off into bottles, or otherwise into clean casks, as it must not remain above ten or twelve days at most on the finings.

Cider when fine will be perfectly clear and transparent; till then it is not fit for bottling. The bottles must be dry; a few drops of water would spoil a bottle of cider. The corks before driving should be dipped in cider, and driven with a wooden bat, turning the nose of the bottle down, so that the cider shall come in contact with the cork, otherwise there will be danger of breaking the bottles. A tea-spoonful of brandy added to each bottle, is said to have a good effect in lessening the fermentation, and thereby preventing the bottles bursting. Bottles when put away should be laid on their sides, that the corks may be kept swollen so as to prevent any escape of gas.

If cider is to be kept in casks after May, early in the spring cover the bungs with rosin, or cement of some kind. To do this open a spile hole while the cement is laid on; otherwise no art can cover the bung effectually; the air from within will force up the cement through the smallest passage, and disappoint a thousand attempts to fill it up. When covered, and the cement cooled, make the cask tight by driving an oak spile into the hole.

"Farmers," says Mr. Lowell, "drink a miserable liquor instead of an excellent one which they might have: they obtain a reduced price for the article, in consequence of the bad state in which it is brought to market. If they should reduce the liquor into a *vinous and refined* state, before it is carried to market, they would obtain five and even ten dollars a barrel instead of three.

"Something, too, must be allowed for the addition to their own comfort and enjoyment. With three days' labour of one man, forty barrels of cider may be sufficiently attended to, racked one or more times, the casks rinsed, and stummed with sulphur; then the farmer would never have to resort to foreign liquor to regale his friends. A good bottle of cider is often equal to the best champaigne, the most popular wine in France."

Vinegar.—The principal requisites to form good vinegar, re, 1. Contact with the air; 2. A temperature not exceeding

20 degrees of Reaumur (77 of Fahrenheit); 3. The addition of some extraneous vegetable matter to promote the acetous fermentation; and 4. The presence of alcohol. Vinegar can be made from cider, from the juice of currants, from sugar and water with a little whiskey: a cask that has been used to keep vinegar in, is the best cask to make it in. If cider is too weak, add half a pound of sugar and half a gill of whiskey to each gallon, and set the cask in the sun, covering the bung hole slightly to admit the air and exclude the dust.

Vinegar, however, is best made thus: to a quarter cask of good cider, add 4 pounds of white Havana sugar, and half a pound of argol or rough tartar in fine powder; it will be better for the addition of some lees of wine; expose it to the heat not less than 75 degrees nor more than 80 degrees, with the bung out. Twice or thrice a day, draw off a pailful, and after it has stood exposed to the air a quarter of an hour, return it into the bung hole by a funnel.

The method of imitating wine vinegar in the English manufactories, is as follows: In a long room, quarter casks of cider placed upright, side by side, raised above the floor about twenty inches, occupy all sides of the room, which by means of stoves is kept at a temperature of about 80 degrees of Fahrenheit. The top of the cask is bored full of holes; on each cask is placed a tub holding about half a bushel or more of Malaga raisins.

The sole occupation of the man who attends the room, is to go round incessantly, and draw a pailful from the bottom, and pour it upon the Malaga raisins; the cider percolates through the raisins, and runs into the cask by means of the holes in the top. This gives the wine flavour and body. The operation takes about a fortnight, according to the strength of the cider; when this is weak, sugar and powdered tartar are put in. The tartar certainly adds to the strength of the acid, and also to the vinous taste, but the acid of tartar is by no means so wholesome as the acid of vinegar. Tartar can be discovered by means of sugar of lead: the tartrate of lead precipitates; the acetate of lead is soluble.

The Pear Tree.—Of the pear tree as well as the apple tree, there are many varieties: as these do not re-produce themselves from the seed, and as the plant furnished by layers, cuttings and scions, are very indifferent, the pear tree is usually propagated by scions and buds. They may be grafted on quince or pear stocks. The best fruit is usually produced from quince stocks; but though finer in quality, it is not so abundant in quantity as that produced from pear stocks.

We give the following from Mr. Kenrick's select list of fruits, as contained in his New American Orchardist. Those who would be more particular, will do well to consult that book.

Summer fruit: Green Chissel, Early Rousselet, Jargonelle, St. John's, Skinless.

Autumn fruit: Andrews, Bartlett, Capsheaf, Dix, Dutchess D'Angouleme, Fulton, Gore's Heathcot, Harvard, Golden Beurre of Bilboa, Marie Louise, Napoleon, Wilkinson.

Winter fruit: Diel, Lewis, Passe Colmar.

Winter baking Pear: Catillac, Pound.

A pear tree should be left pretty much to its own growth. It may, however, sometimes be necessary to apply the knife, in which case it should be merely to keep the head of the tree tolerably well open in the middle, and to preserve its pyramidal shape, by shortening the wood on that side where it grows too luxuriantly.

Diseases.—The pear tree is liable to injury from the *slug-worm,* which usually appears on the upper surface of the leaves, in the month of July. They may be easily destroyed by sifting air-slaked lime over them. The *curculio* is also an enemy of the pear tree; and may be treated in the manner already described under the head of the apple tree. The fire blight is another serious disease which often attacks this tree.

"One reason," says Mr. Goodsell, "why horticulturists have not made more satisfactory discoveries as to the cause of this disease is, that they have not commenced their examinations sufficiently early, and have been led to watch the progress of it after the first cause has ceased to operate.

"I am inclined to think that careful examinations will support the following conclusions.

"*First*—That the blight in pear, apple, and quince trees, is occasioned by an insect.

"*Secondly*—That it is communicated to the pistil of the flower at the time that organ is in its greatest perfection, or during the expansion of the flower.

"*Thirdly*—That it gradually spreads from the point of infection to other parts of the tree, in a manner similar to mortification in the animal kingdom.

"*Fourthly*—That it is as capable of being communicated by inoculation as the small-pox.

"*Fifthly*—That no tree has it, unless by inoculation, until it has produced flowers.

"In support of the first conclusion, so far as we have observed this disease, it has spread from the place where it first commenced in an orchard in every direction, without reference to the general course of the wind at the time; and as the quince does not come into flower until after the pear has shed its flower, it cannot be attributed to an intermixture of pollen from the pear tree.

"That it commences at the point of the pistil has been evident from every case we have examined, before the different parts of the flower are decayed. It often appears that not more than one flower in the cluster is infected: the fruit of the infected flower does not swell as the others, which continue their growth, until the mortification has by degrees descended through the stem, to the woody part of the fruit spur, over which it spreads, and ascends the stems of the remaining part of the cluster, which may readily be observed, by a discolouration of them as it advances. In this section of the country the disease will be found to have advanced thus far by the first of June, when the leaves on the fruit spur, so affected, will be found withering. After this, the rapidity with which it spreads, depends on circumstances. Where there is the greatest quantity of alburnum, or elaborated sap, the disease spreads with the greatest rapidity, which is increased by the state of the atmosphere; as in warm moist weather it progresses further than when dry and cool.

"It is not till the middle of June, that this disease begins to manifest itself to superficial observers. About this time the mortification from the fruit spurs, will have reached the limbs; and where they are numerous, and most of them affected, they will in a short time destroy the branch, so as to cut off all communication between the bark and wood. As the ascending sap passes through the sap-wood to the leaves, before it is elaborated, this communication is not cut off until later in the season, and the outer ends of the limbs remain green, until the disease has penetrated the wood; at which time the ascent of the sap is cut off, and the whole limb becomes discoloured in a short time, often in the space of a few hours.

"We do not pretend to be such an adept in the science of vegetable pathology, as to be able to describe the manner in which the virus of this disease acts upon the healthy parts of the tree; but of this we are satisfied, by repeated experiments, *that it is as capable of being communicated by infection as the small-pox, or any disease to which the human family is subject.* The manner in which we have conducted these experiments is as follows: We have taken the discoloured vivid matter from between the bark and wood of a diseased limb, and put it beneath the bark of a healthy tree, in some instances covering the wound with a strip of rag, which had been dipped in melted grafting wax, in others leaving the incision open; in some instances the quantity of *virus* introduced into the healthy tree was not greater than would be used to inoculate a person for the small-pox; and yet in every instance, within from three to five days, the disease has shown itself spreading the same as in a tree which had it the '*natural way.*'

"Trees do not have it the natural way until they have put forth blossoms. We have repeatedly seen young trees growing near those which were in a diseased state, which remained in perfect vigour, and this present season we have examined one which was of a large size which had never produced any blossoms before, and this year only upon one small limb, which produced one dozen bunches of flowers, nearly all of which were diseased, so that we think by the first of July the limb will have turned as black as if it had been scorched by fire.

"Amputation is the only remedy known at present. As soon as the disease is observed, the limb should be cut off below where it can be discovered, in doing which the operator should remember that the smallest quantity of *virus* is sufficient to communicate it to a healthy part, if brought in contact between the bark and the wood; he should, therefore, be careful not to use an instrument for amputation which has been used to examine the diseased parts, unless it has been thoroughly cleansed.

"We have been thus lengthy in regard to this disease, because it is one of vital importance to every farmer who would cultivate a valuable orchard, or is fond of this delicious fruit."

The Peach Tree.—A rich sandy loam is the soil best suited to the peach tree. If the soil be not naturally of this description, a bushel or two of sand thrown around the root of the tree at planting will greatly improve it. Some writers say the ground should never be manured with stable dung. If the ground is very poor, let some good mould from the ditches, or hill sides, &c. be applied. Manure is said to spoil the flavour of the fruit, and to cause it to rot prematurely. The land for cherries, pears, and apples, cannot be too rich, but it is otherwise with the peach. "The largest and finest peaches I have ever seen," says an experienced cultivator, "(the heath and yellow Canada,) were raised on a soil that would not have produced more than ten or twelve bushels of corn to the acre."

Peach trees are usually inoculated on the peach stock; they are, however, sometimes propagated on the plum or almond stock. They may be planted from ten to twelve feet apart. The ground should not be stirred about them when the fruit is on; but according to some, the cultivation of the ground is highly useful at other times.

"In our climate," says Kenrick, "the peach is almost universally cultivated as a standard. They are rarely pruned at all; they are sometimes, however, renovated by heading down; this operation should be performed just before the sap rises in the spring." Another writer says, "of all the fruit trees produced in this climate, none bears pruning so freely as the peach; indeed it should be treated very much as the vine is. All those branches which have borne fruit should be cut out, if there is young wood enough to supply their places. In proof of which, he says, if you take a limb which has borne two or three crops of fruit, and observe its produce; then take another of the same tree, which has never borne at all, and the fruit on this last will be twice the size of the former, fairer, and less liable to rot. In pruning, the branches should be taken or cut out of the middle of the tree, to give more air and sun to the fruit on the outer limbs.

Peaches are either of the *free stone* or *cling stone* kind.

We give a list of the approved sorts of each, arranged according to the order of their ripening.

Free stones.—Grosse Mignone (red rare ripe), Belle Chevreuse, Double Montage, Bellegarde, Late Purple, Morrisania Pound, &c.

Cling stones.—Early Newington, Congress, La Fayette, Oldmixon Clingstone, Pavie Admirable, Heath, &c.

Peach trees are destroyed by a worm which feeds on the inner bark of the tree, at its root. This worm is said to be the offspring of a fly of the wasp kind, which deposits its eggs in the bark of the root of the tree while it is yet tender and young. The remedy consists in searching for the opening in the bark at the root, and taking them out. If this operation is repeated three or four springs, the worm never after can make a lodgement there. The bark of the tree by this time becomes so hard, that the fly cannot make the puncture in order to deposit the egg, or if deposited it perishes. After the worm is cut out in the spring, draw the earth up around the body of the tree, six or eight inches above the other ground.

There are several other ways prescribed to remedy this evil. Unleached ashes applied around the root of the tree about the beginning of June, being formed into a small mound, will protect the tree where the bark is most tender. This should be levelled in October, to give the bark an opportunity of hardening. It is suggested that the wash of potash, heretofore described, might, by a proper application, at a suitable time, after the deposition of the eggs of the insect, prevent their generation.

Mr. Ellis, of New Jersey, prevents the injury arising from the worm by the use of rye straw. In the spring, when the blossoms are out, clear away the dirt so as to expose the root of the tree to the depth of three inches; surround the tree with straw about three feet long, applied lengthways, so that it may have a covering one inch thick, which extends to the bottom of the hole, the butt ends of the straw resting upon the ground at the bottom. Bind this straw round the tree with three bands, one near the top, one at the middle, and the third at the surface of the earth; then fill up the hole at the root with earth, and press it closely around the straw. When the white frost appears the straw should be removed, and the tree remain uncovered until the blossoms put out in the spring. By this process the fly is prevented from depositing the egg within three feet of the root; and although it may place the egg above that distance, the worm travels so slow that it cannot reach the ground before frost, and therefore it is killed before it is able to reach the tree.

When the *curculio* attacks the peach tree, let it be treated as before recommended.

The *yellows* is a disease of a more serious nature; for as neither the source nor the precise character of the disease is understood, it has hitherto baffled every endeavour to subdue it. The yellows is capable of being communicated from one tree to another, and the consequence is certain death. A knife, which has been used in pruning a diseased tree, will communicate it to a healthy one. It will spread through a whole orchard, like a contagion, as it is, if the trees infected be not immediately destroyed. This, therefore, is the only remedy yet known. As the time of blooming in the spring is supposed to be the period of taking the disease, all trees, when discovered to be infected, should be previously removed.

Peach trees are also liable to be injured by the bursting of the bark from severe frost in wet winters, and the splitting off of the limbs at the fork of the tree. The first is to be prevented by planting the trees where the water will readily run off; and the second, by proper pruning and attention.

Apricots and Nectarines.—The culture of these trees is in all respects like that of the peach, and will not, therefore, be separately treated of.

The Plum Tree.—The plum tree delights in a soil like that of the peach—neither too dry nor too moist.

The varieties are propagated either by inoculation on plum stocks, or from seed. Those produced from the seed are preferred.

In favourable climates it should always be cultivated as a standard, and will then require only a little annual labour about the roots, and the removal from the head of dead and dying branches.

Some plum trees are liable to be attacked by a worm, which occasions the formation of large bunches on the limbs. These diseased limbs are to be removed and burnt, and even the whole tree if it should be badly infected, to the end that it may not communicate to others.

The best recommended sorts are—the Prescoe of Tours, Early Damson, Green Mirabelle, St. Catherine, White Perdrigon, Imperatrice, and all the Gages—Blue, Violet, and Green.

The Cherry Tree.—Cherry trees are propagated by budding and grafting, unless to produce stems or new varieties, when the seeds are sown in autumn. The soil required is similar to that for the peach. Cherry trees do not require much pruning.

The sorts to be preferred are—the May Duke, Early Black, large Black-Heart, Frazier's Tartarian, the Elton, Bleeding Heart, Cerone, Black Gean, Florence, Amber Heart, and the Morello.

The Quince.—There are several varieties of the quince, called the Apple, the Pear, the Portugal, &c. Of these, the latter is considered the best.

The quince is propagated by seeds, layers, cuttings, and suckers. But the surest and most usual way, is by cuttings.

They require a rich and moist soil, and a sheltered situation. When they are once growing, little further attention is required than to remove useless suckers, and dead or decayed wood.

APPENDIX.

B.—Page 41.

From the Farmers' Cabinet.

Turnips.—In the spring of 1837, wishing to make an experiment in the culture of turnips, I selected an acre which had been well ploughed the previous fall. The preceding crop was potatoes, yielding about two hundred bushels to the acre. In the month of May the ground was ploughed again, and well harrowed. Cattle were then turned in occasionally upon the ground, until the 15th of June, when it was ploughed again, well harrowed, and marked out into drills running north and south. I then divided the patch into four equal parts. To one I gave a common dressing of stable manure; another, an extra quantity of compost manure; in both cases it was spread upon the drills, the seed sown immediately, and the whole rolled. The next day planted the remaining two sections; on one I sowed ten bushels of fine lime with two and a half of wood ashes. The other remaining quarter of an acre received a dressing of two bushels of bone dust. Those dressed with manure appeared about the same time above the soil, and, for a season, seemed to take the lead of their neighbours. They were all kept equally clean of weeds, and the soil was retained, as far as possible, in a finely pulverized state, so as to enable it to imbibe the moisture of the atmosphere. They all escaped the fly—not so the turnip worm, as sections 1 and 2 suffered by it; those parts dressed with stable manure and compost maintained apparently their ascendancy until about the 15th of July, when the others appeared to take the lead. The soil was then again well pulverized, and the whole cleared from all extraneous plants. As the turnips required thinning, commenced that operation about the latter end of July, and must have furnished many bushels, at least forty, to my stock. Unfortunately, I kept no account. On the 10th of November, they were gathered in with the following result:

Section 1. Dressed with stable manure, yielded 98 bushels, rate of 390 per acre.

Section 2. Dressed with compost, yielded 124 bushels, rate of 496 per acre.

Section 3. Dressed with lime and wood ashes, yielded 185 bushels, rate of 740 per acre.

Section 4. Dressed with bone dust, yielded 213 bushels, rate of 852 per acre.

The turnips were not sent to market, but fed to stock, and excellent feed they proved to be, and added not a little to my manure. The interest on the land, and the expenses of cultivation, &c., including the manures, amounted to $29 75. They were worth to me, as fed to stock, at least 25 cents per bushel, but say 20 cents; this would be $124 for the yield of the acre, which will leave $94 25 per acre as the proceeds. Now if we farmers can but average the half of this, we shall be doing a clear business. I did not clear the fifth part of it on my wheat lands. I shall hereafter study a little more variety and not stake all a year's labour on a single staple crop. I have seen, yes, and I have *felt* the effects. I am determined to make a part of my farm as good as I can by being "*kind* to the soil." I will see this and the ensuing season, if I am spared, what a liberal and judicious application of manure, and keeping the soil well pulverized, will produce. But one word to those who raise turnips,—don't select a cold, stiff, clayey, tenacious soil—it won't do. I tried it and failed. The experiment detailed above was made upon a loamy soil, somewhat inclined to a gravelly texture. Your friend and subscriber,

SAMUEL W. SMITH.

C.—PAGE 59.

From Parkes's Chemical Catechism.

Muriate of soda is the salt which has been longest known. It is our common culinary salt, and is supposed to furnish the necessary supply of soda to preserve the bile in an alkaline and antiseptic condition.

This salt is of great use to the animal creation; horses are very fond of it; and cows give more milk when supplied with it. Dr. MITCHIL relates, that in the back settlements of America, wherever this salt abounds, thither the wild beasts of the forests assemble to regale themselves; and that some of these places are so much frequented, that the ground is trodden to mud by them. The natives call these spots *licks*, or licking-places. In some parts of Africa, large herds of cattle travel from great distances at stated seasons to enjoy the marine plants which grow on the coast, and are saturated with sea-salt. The fattening property of our own salt-marshes is well known to graziers and farmers.

The greatest improvements in agriculture may be expected from the use of sea-salt. Mr. LE GOUX, in his history of the cocoa-nut tree, tells us that the inhabitants of those parts of Hindostan and China which border on the sea-coast sprinkle their rice-fields with sea-water, and use no other manure; and that in the interior of these countries they sprinkle the lands with salt before they are tilled; and that this practice has been followed for ages with the greatest advantage.

D.—PAGE 71.

From the Penny Cyclopædia.

DRAINING.—As a certain quantity of moisture is essential to vegetation, so an excess of it is highly detrimental. In the removal of this excess consists the art of draining.

Water may render land unproductive by covering it entirely or partially, forming lakes or bogs; or there may be an excess of moisture diffused through the soil and stagnating in it, by which the fibres of the roots of all plants which are uot aquatic are injured, if not destroyed.

From these different causes of infertility arise three different branches of the art of draining, which require to be separately noticed.

1. To drain land which is flooded or rendered marshy by water coming over it from a higher level, and having no adequate outlet below.
2. To drain land where springs rise to the surface, and where there are no natural channels for the water to run off.
3. To drain land which is wet from its impervious nature, and where the evaporation is not sufficient to carry off all the water supplied by snow and rain.

The first branch includes all those extensive operations where large tracts of land are reclaimed by means of embankments, canals, sluices, and mills to raise the water; or where deep cuts or tunnels are made through hills which formed a natural dam or barrier to the water. Such works are generally undertaken by associations under the sanction of the government, or by the government itself; few individuals being possessed of sufficient capital, or having the power to oblige all whose interests are affected by the draining of the land to give their consent and afford assistance. In the British dominions there is no difficulty in obtaining the sanction of the legislature to any undertaking which appears likely to be of public benefit. In every session of parliament, acts are passed giving certain powers and privileges to companies or individuals, in order to enable them to put into execution extensive plans of draining. That extensive draining in the counties of Northampton, Huntingdon, Cambridge, Lincoln, Norfolk, and Suffolk, which is known by the name of the *Bedford Level*, was confided to the management of a chartered corporation, with considerable powers, as early as the middle of the seventeenth century, and by this means an immense extent of land has been rendered highly productive, which before was nothing but one continued marsh or fen.

In the valleys of the Jura, in the canton of Neufchatel in Switzerland, which are noted for their industry and prosperity, and where the manufacture of watches is so extensive as to supply a great part of Europe with this useful article, extensive lakes and marshes have been completely laid dry, by making a tunnel through the solid rock, and forming an outlet for the waters. All these operations require the science and experience of civil engineers, and cannot be undertaken without great means. The greater part of the lowlands in the Netherlands, especially in the province of Holland, have been reclaimed from the sea, or the rivers which flowed over them, by embanking and draining, and are only kept from floods by a constant attention to the works originally erected.

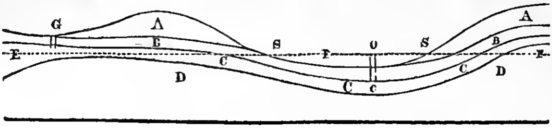
Where the land is below the level of the sea at high water, and without the smallest eminence, it requires a constant removal of the water which percolates through the banks or accumulates by rains; and this can only be effected by sluices and mills, as is the case in the fens in England. The water is collected in numerous ditches and canals, and led to the points where it can most conveniently be discharged over the banks. The mills commonly erected for this purpose are small windmills, which turn a kind of perpetual screw made of wood several feet in diameter, on a solid axle. This screw fits a semicircular trough which lies inclined at an angle of about 30° with the horizon. The lower part dips into the water below, and by its revolution discharges the water into a reservoir above. All the friction of pumps and the consequent wearing out of the machinery is thus avoided. If the mills are properly constructed, they require little attendance, and work night and day whenever the wind blows.

In hilly countries it sometimes happens that the waters, which run down the slopes of the hills collect in the bottoms where there is no outlet, and where the soil is impervious. In that case it may sometimes be laid dry by cutting a sufficient channel all round, to intercept the waters as they flow down and to carry them over or through the lowest part of the surrounding barrier. If there are no very abundant springs in the bottom, a few ditches and ponds will suffice to dry the soil by evaporation from their surface. We shall see that this principle may be applied with great advantage in many cases where the water could not be drained out of considerable hollows if it were allowed to run into them.

When there are different levels at which the water is pent up, the draining should always be begun at the highest; because it may happen that when this is laid dry, the lower may not have a great excess of water. At all events, if the water is to be raised by mechanical power, there is a saving in raising it from the highest level, instead of letting it run down to a lower from which it has to be raised so much higher.

In draining a great extent of land it is often necessary to widen and deepen rivers and alter their course; and not unfrequently the water cannot be let off without being carried by means of tunnels under the bed of some river, the level of which is above that of the land. In more confined operations cast-iron pipes are often a cheap and easy means of effecting this. They may be bent in a curve so as not to impede the course of the river or the navigation of a canal.

The draining of land which is rendered wet by springs arising from under the soil is a branch of more general application. The principles on which the operations are carried on apply as well to a small field as to the greatest extent of land. The object is to find the readiest channels by which the superfluous water may be carried off; and for this purpose an accurate knowledge of the strata through which the springs rise is indispensable. It would be useless labour merely to let the water run into drains after it has sprung through the soil and appears at the surface, as ignorant men frequently attempt to do, and thus carry it off after it has already soaked the soil. But the origin of the springs must, if possible, be detected; and one single drain or ditch judiciously disposed may lay a great extent of land dry if it cuts off the springs before they run into the soil. Abundant springs which flow continually generally proceed from the outbreaking of some porous stratum in which the waters were confined, or through natural crevices in rocks or impervious earth. A knowledge of the geology of the country will greatly assist in tracing this, and the springs may be cut off with greater certainty. But it is not these main springs which give the greatest trouble to an experienced drainer; it is the various land springs which are sometimes branches of the former, and often original and independent springs arising from sudden variations in the nature of the soil and subsoil. The annexed diagram representing a section of an uneven surface of land will explain the nature of the strata which produce springs.



Suppose A A a porous substance through which the water filtrates readily; B B a stratum of loam or clay impervious to water. The water which comes through A A will run along the surface of B B towards S S, where it will spring to the surface and form a lake or bog between S and S. Suppose another gravelly or pervious stratum under the last, as C C C bending as here represented, and filled with water running into it from a higher level; it is evident that this stratum will be saturated with water up to the dotted line E F F, which is the level of the point in the lower rock, or impervious stratum D D, where the water can run over it. If the stratum B B has any crevices in it below the dotted line, the water will rise through these to the surface and form springs rising from the bottom of the lake or bog: and if B B were bored through and a pipe inserted rising up to the dotted line, as *c o*, the water would rise, and stand at *o*. If there were no springs at S S the space below the dotted line might still be filled with water rising from the stratum C C C. But if the boring took place at G the water would not rise, but on the contrary, if there were any on the surface, it would be carried down to the porous stratum E C C, and run off. Thus in one situation boring will bring water, and in another it will take it off. This principle being well understood will greatly facilitate all draining of springs. Wherever water springs there must be a pervious and an impervious stratum to cause it, and the water either runs over the impervious surface or rises through the crevices in it. When the line of the springs is found, as at S S, the obvious remedy is to cut a channel with a sufficient declivity to take off the water in a direction across this line, and sunk through the porous soil at the surface into the lower impervious earth. The place for this channel is where the porous soil is the shallowest above the breaking out, so as to require the least depth of drain; but the solid stratum must be reached, or the draining will be imperfect. It is by attending to all these circumstances that Elkington acquired his celebrity in draining, and that he has been considered as the father of the system. It is however of much earlier invention, and is too obvious not to have struck any one who seriously considered the subject. In the practical application of the principle, great ingenuity and skill may be displayed, and the desired effect may be produced more or less completely, and at a greater or less expense. The advice of a scientific and practical drainer is always well worth the cost at which it may be obtained.

When there is a great variation in the soil, and it is difficult to find any main line of springs, it is best to proceed experimentally by making pits a few feet deep, or by boring in various parts where water appears, observing the level at which the water stands in these pits or bores, as well as the nature of the soil taken out. Thus it will generally be easy to ascertain whence the water arises, and how it may be let off. When there is a mound of light soil over a more impervious stratum, the springs will break out all round the edge of the mound; a drain laid round the base will take off all the water which arises from this cause, and the lower part of the land will be effectually laid dry. So likewise where there is a hollow or depression of which the bottom is clay with sand in the upper part, a drain laid along the edge of the hollow and carried round it, will prevent the water running down into it, and forming a marsh at the bottom.

When the drains cannot be carried to a sufficient depth to take the water out of the porous stratum saturated with it, it is often useful to bore numerous holes with an auger in the bottom of the drain through the stiffer soil, and, according to the principle explained in the diagram, the water will either rise through these bores into the drains and be carried off, and the natural springs will be dried up, or it will sink down through them as at G, in the section, if it lies above. This method is often advantageous in the draining of peat mosses, which generally lie on clay or stiff loam, with a layer of gravel between the loam and the peat, the whole lying in a basin or hollow, and often on a declivity. The peat, though it retains water, is not pervious, and drains may be cut into it which will hold water. When the drains are four or five feet deep and the peat is much deeper, holes are bored down to the clay below, and the water is pressed up through these holes, by the weight of the whole body of peat, into the drains, by which it is carried off. The bottom of the drains is sometimes choked with loose sand, which flows up with the water, and they require to be cleared repeatedly; but this soon ceases after the first rush is past, and the water rises slowly and regularly. The surface of the peat being dried, dressed with lime, and consolidated with earth and gravel, soon becomes productive. If the soil, whatever be its nature, can be drained to a certain depth, it is of no consequence what water may be lodged below it. It is only when it rises so as to stagnate about the roots of plants that it is hurtful. Land may be drained so much as to be deteriorated, as experience has shown.

When a single large and deep drain will produce the desired effect, it is much better than when there are several smaller, as large drains are more easily kept open, and last longer than smaller; but this is only the case in tapping main springs, for if the water is diffused through the surrounding soil, numerous small drains are more effective: but as soon as there is a sufficient body of water collected, the smaller drains should run into larger, and these into main drains, which should all, as far as is practicable, unite in one principal outlet, by which means there will be less chance of their being choked up. When the water springs into a drain from below, it is best to fill up that part of the drain which lies above the stones or other materials which form the channel with solid earth, well pressed in, and made impervious to within a few inches of the bottom of the furrows in ploughed land, or the sod in pastures; because the water running along the surface is apt to carry loose earth with it, and choke the drains. When the water comes in by the side of the drains, loose stones or gravel, or any porous material, should be laid in them to the line where the water comes in, and a little above it, over which the earth may be rammed in tight so as to allow the horses to walk over the drain without sinking in.

It sometimes happens, that the water collected from springs which caused marshes and bogs below, by being carried in new channels, may be usefully employed in irrigating the land which it rendered barren before; not only removing the cause of barrenness, but adding positive fertility. In this case the lower grounds must have numerous drains in it, in order that the water let on to irrigate it may not stagnate upon it, but run off after it has answered its purpose.

The third branch in the art of draining is the removal of water from impervious soils which lie flat, or in hollows, where the water from rain, snow, or dews, which cannot sink into the soil on account of its impervious nature, and which cannot be carried off by evaporation, runs along the surface and stagnates in every depression. This is by far the most expensive operation, in consequence of the number of drains required to lay the surface dry, and the necessity of filling them with porous substances, through which the surface water can penetrate. It requires much skill and practice to lay out the drains so as to produce the greatest effect at the least expense. There is often a layer of light earth immediately over a substratum of clay, and after continued rains this soil becomes filled with water, like a sponge, and no healthy vegetation can take place. In this case numerous drains must be made in the subsoil, and over the draining tiles or bushes, which may be laid at the bottom of the drains, loose gravel or broken stones must be laid in to within a foot of the surface, so that the plough shall not reach them. The water will gradually sink into these drains, and be carried off, and the loose wet soil will become firm and dry. In no case is the advantage of draining more immediately apparent.

It is very seldom that a field is absolutely level; the first thing therefore to be ascertained is the greatest inclination and its direction. For this purpose there is an instrument essential to a drainer, with which an accurately horizontal line can be ascertained, by means of a plummet or a spirit level. A sufficient fall may thus be found or artificially made in the drains to carry off the water. The next object is to arrange drains so that each shall collect as much of the water in the soil as possible. Large drains, except as main drains, are inadmissible, since it is by the surface that the water is to come in, and two small drains will collect more than a larger and deeper. The depth should be such only that the plough may not reach it, if the land is arable, or the feet of cattle tread it in, if it be in pasture. All the drains which are to collect the water should lie as nearly at right angles to the inclination of the surface as is consistent with a sufficient fall in the drains to make them run. One foot is sufficient fall for a drain 300 feet in length, provided the drains be not more than 20 feet apart. The main drains, by being laid obliquely across the fall of the ground, will help to take off a part of the surface water. It is evident that the drains can seldom be in a straight line, unless the ground be perfectly even. They should, however, never have sudden turns, but be bent gradually where the direction is changed. The flatter the surface and the stiffer the soil, the greater number of drains will be required. It is a common practice with drainers to run a main drain directly down the slope, however rapid, and to carry smaller drains into this alternately on the right and left, which they call herring-bone fashion. But this can only be approved of where the ground is nearly level, and where there is very little fall for the main drain. A considerable fall is to be avoided as much as possible; and every drain should lie obliquely to the natural run of the water. It generally happens that, besides surface water, there are also some land springs arising from a variation in the soil; these should be carefully ascertained, and the drains should be so laid as to cut them off.

In draining clay land, where there is only a layer of a few inches of loooser soil over a solid clay which the plough never stirs, the drains need not be deeper than two feet in the solid clay, nor wider than they can be made without the sides falling in. The common draining tile, which is a flat tile bent in the form of half a cylinder, and which can be made at a very cheap rate with the patent machine, is the best for extensive surface draining. In solid clay it requires no flat tile under it, it is merely an arch to carry the loose stones or earth with which the drain is filled up. Loose round stones or pebbles are the best where they can be procured; and in default of them, bushes, heath, or straw, may be laid immediately over the tiles, and the most porous earth that can be got must be used to fill the drains up: the stiff clay which was dug out must be taken away or spread over the surface; for if it were put in the drain, it would defeat the object in view by preventing the water from running into it from above. In grass land, the sod may be laid over the drain, after it has been filled up so as to form a slight ridge over it. This will soon sink to a level with the surface, and in the mean time serves to catch the water as it runs down. To save the expense of stone or tiles, drains are frequently made six inches wide at the bottom, a narrow channel is cut in the solid clay, two or three inches wide and six deep, leaving a shoulder on each side to support a sod which is cut so as to fit the drain, and rests on the shoulders: this sod keeps the earth from filling the channel; and the water readily finds its way through it, or between it and the sides of the drain. It is filled up as described before: such drains are made at a small expense, and will last for many years.

Where the clay is not sufficiently tenacious, the bottom of the drain is sometimes cut with a sharp angle, and a twisted rope of straw is thrust into it.

This keeps the earth from falling in, and the running of the water keeps the channel open; the straw not being exposed to the air, remains a long time without decaying. This is a common mode of draining in Norfolk, Suffolk, and Essex.

The best materials for large main drains, where they can be procured, are flat stones which readily split, and of which a square or triangular channel is formed in the bottom of the drain. If the drain is made merely as a trunk to carry off the water, it is best to fill it up with earth, well pressed in, over the channel made by the stones; but if it serves for receiving the water through the sides or from the top, fragments of stone should be thrown over it to a certain height, and the earth put over these. A very useful draining tile is used in Berkshire and other places, which requires no flat tile under it, even in loose soils, because it has a flat foot to rest on, formed of the two thick edges of the tile, which, nearly meeting when the tile is bent round, form the foot. The section of the tile is like a horse-shoe. It is well adapted for drains where the water springs upwards, and it is less apt to slip out of its place than the common tile. They are usually made twelve or thirteen inches in length, but they are more expensive than the common tiles.

In draining fields it is usual to make the outlets of the drains in the ditch which bounds them. The fewer outlets there are, the less chance there is of their being choked: they should fall into the ditch at 2 ft. from the bottom, and a wooden trunk, or one of stone, should be laid so that the water may be discharged without carrying the soil from the side of the ditch. If there is water in the ditch, it should be kept below the mouth of the drain. The outlets of all drains should be repeatedly examined, to keep them clear; for wherever water remains in a drain, it will soon derange or choke it. The drains should be so arranged or turned, that the outlet shall meet the ditch at an obtuse angle towards the lower part where the water runs to. A drain brought at right angles into a ditch must necessarily soon be choked by the deposition of sand and earth at its mouth.

As the draining of wet clay soils is the only means by which they can be rendered profitable as arable land, and the expense is great, various instruments and ploughs have been contrived to diminish manual labour and expedite the work. Of these one of the simplest is the common mole-plough, which in very stiff clay makes a small hollow drain, from 1 ft. to 18 in. below the surface, by forcing a pointed iron cylinder horizontally through the ground. It makes a cut through the clay, and leaves a cylindrical channel, through which the water which enters by the slit is carried off. It requires great power to draw it, and can only be used when the clay is moist. In meadows it is extremely useful, and there it need not go more than a foot under the sod. Five to ten acres of grass land may easily be drained by it in a day. It is very apt, however, to be filled in dry weather by the soil falling in; and the animals from which it derives its name often do much damage to it by using it in their subterraneous workings.

But a draining plough has been invented, which, assisted by numerous labourers, greatly accelerates the operation of forming drains, by cutting them out in a regular manner, when they are immediately finished with the usual tools and filled up. It has done wonders in some of the wet stiff soils in Sussex, and is much to be recommended in all wet and heavy clays. In stony land it cannot well be used. The subsoil plough, introduced to public notice by Mr. Smith, of Deanston, may be considered in some measure as a draining plough, for it loosens the subsoil, so that a few main drains are sufficient to carry off all the superfluous moisture; and it has besides the effect of not carrying off more than what is superfluous. By means of judicious drains and the use of the subsoil plough, the stiffest and wettest land may in time become the most fertile.

The tools used in draining are few and simple. Spades, with tapering blades of different sizes, are required to dig the drains of the proper width, and the sides at a proper angle. Hollow spades are used in very stiff clay. When the drain begins to be very narrow near the bottom, scoops are used, of different sizes, which are fixed to handles at various angles, more conveniently to clear the bottom and lay it smooth to the exact width of the tiles, if these are used;

for the more firmly the tiles are kept in their places by the solid sides of the drain, the less likely they are to be moved. (ELKINGTON, STEPHENS, JOHNSTONE, DONALDSON, YOUNG, MARSHALL.)

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THE MACKAY HOG.—This breed was introduced into the United States by Capt. JOHN MACKAY, of Boston, and those offered by him have repeatedly received premiums from the Agricultural Society of Massachusetts. This variety has for a long while been most widely scattered and generally esteemed, in the north-eastern portion of New England. An extract of a letter addressed to the Hon. HENRY L. ELLSWORTH by ELIAS PHINNEY, Esq., of Massachusetts, is as follows:—"To your inquiry as to what breed of hogs I prefer, I will state, a cross of the Berkshire with the Mackay, which are my principal breeds. With the history of the Berkshire pig you are no doubt acquainted. The Mackay pigs were imported into this country from England about fifteen years since, by Capt. MACKAY, of Boston, from whom they derive their name, and till within a few years were decidedly the best breed in New England, and perhaps in America. But in consequence of breeding *'in-and-in,'* as it is termed, they had greatly degenerated, had become weak and feeble in constitution, small in size, ill shaped, and in many instances deformed. When first imported, Capt. MACKAY, on his farm at Boston, not unfrequently brought them up to 600 lbs. at the age of eighteen months. In all the essential points, they greatly exceeded the Berkshire, particularly in lightness of offal, greater weight of the more valuable parts, firmness and delicacy of limb, thinness of skin, roundness of body, &c., but withal a hog of feeble constitution. With a view of restoring some of the good qualities of this breed and uniting them with the healthy constitution of others, I tried various crosses without much success. One of those which did pretty well, was with the Moco, so called, which I obtained from the Genesee county, in the state of New York. But decidedly the most fortunate cross is with the Berkshire, which I obtained from my friend Mr. BEMENT, of Albany, about three years since. The produce of this cross is a breed which far exceeds those of any other, possessing all the good and useful qualities of the Mackay, united to the vigour, size, and health, without the coarseness of the Berkshire. The best pigs, however, that I have ever raised, were by putting a full-blooded Berkshire boar to a sow, which was a cross of the Mackay with the Moco—the produce being half Berkshire, a quarter Mackay, and a quarter Moco.

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Mr. PHINNEY, in an able letter published in the New England Farmer, remarks—"On a large farm, where much green herbage is produced, and where the value of the manure is taken into account, I consider the pigs killed at the age of fifteen or sixteen months as giving the greatest profit. When it is intended to kill them at this age, they may be kept on more ordinary and cheaper food for the first ten or twelve months, or till within four or five months of the time of killing. The manure they make more than pays the extra expense incurred in keeping them the longer time; but spring pigs which are to be killed the ensuing winter and spring must be kept upon the best of food from the time they are taken from the sow until they are slaughtered."

Mr. PHINNEY, in corresponding with the Hon. H. L. ELLSWORTH, of Washington, remarks as follows:

"I have been for a number of years engaged in the rearing and fattening of swine, and my establishment is viewed as one of considerable magnitude, when compared with others in this part of the country, but when compared with those in the western states, it must be very diminutive. A late writer in the Yankee Farmer, which you may have noticed, has greatly exaggerated the profits of my piggery. The average price of corn in this market is $1 per bushel, and potatoes, 33 cents;—at these prices my sales of pork have always exceeded the expense of keeping, and given me a handsome profit, besides the manure taken from my sties, which is of great value on my farm,—usually not less than five hundred cart loads annually.

"In some cases, my best pigs, upon four quarts of Indian meal, with an equal quantity of potatoes, apples or pumpkins, well cooked, have been made to gain *two* pounds a day. At this rate, it may be seen, there is a profit in fattening pork at the above price of grain.

"The older class of pigs for the first ten or twelve months, are kept principally upon brewers' grains, with a small quantity of Indian or barley meal, or rice, ruta-baga, sugar-beet, &c., and in the season of clover, peas, oats, corn-stalks, weeds, &c., they are cut green and thrown into the pens; the next four or five months before killing, they have as much Indian meal, barley meal or rice, with an equal quantity of potatoes, apples or pumpkins as they will eat, the whole being well cooked and salted, and given to them about blood warm. During the season of fattening, an ear or two of hard corn is every day given to each pig. This small quantity they will digest well, and of course there is no waste. Shelled corn soaked in water made as salt as the water of the ocean, for forty-eight hours, with a quart of wood ashes added to each bushel, and given to them occasionally in small quantities, greatly promotes their health and growth. Their health and appetite is also greatly promoted by throwing a handful of charcoal once or twice a week into each of their pens. Their principal food should, however, be cooked as thoroughly and as nicely as if intended for table use. From long practice and repeated experiments, I am convinced that two dollars worth of material, well cooked, will make as much pork as three dollars worth of the same material given in a raw state.

"If intended for killing at the age of nine or ten months, they should be full fed all the time and kept as fat as possible. If on the other hand they are intended for killing at the age of fifteen or eighteen months, they should not be full fed, nor be made very fat for the first ten or twelve months.

"To satisfy myself of the benefit of this course, I took six of my best pigs, eight weeks old, all of the same litter, and shut them in two pens, three in each. Three of these I fed very high and kept them as fat all the time as they could be made. The other three were fed sparingly, upon coarse food, but kept in a healthy, growing condition, till within four or five months of the time of killing, when they were fed as high as the others. They were all slaughtered at the same time, being then sixteen months old. At the age of nine months, the full fed pigs were much the heaviest, but at the time of killing, the pigs fed sparingly, for the first ten or twelve months weighed, upon an average, fifty pounds each more than the others. Besides this additional weight of pork, the three "lean kine" added much more than the others to my manure heap. These results would seem very obvious to any one who has noticed the habits of the animal. In consequence of short feeding they were much more active and industrious in the manufacture of compost, and this activity at the same time caused the muscles to enlarge and the frame to spread, while the very fat pigs became inactive, and like indolent bipeds, they neither worked for their own benefit nor for that of others.

"For the purpose of increasing my manure heap, my pens are kept constantly supplied with peat or swamp mud, about three hundred loads of which are annually thrown into my styes. This, with the manure from my horse stable, which is daily thrown in, and the weeds and coarse herbage which are gathered from the farm, give me about five hundred cart loads of manure in a year."

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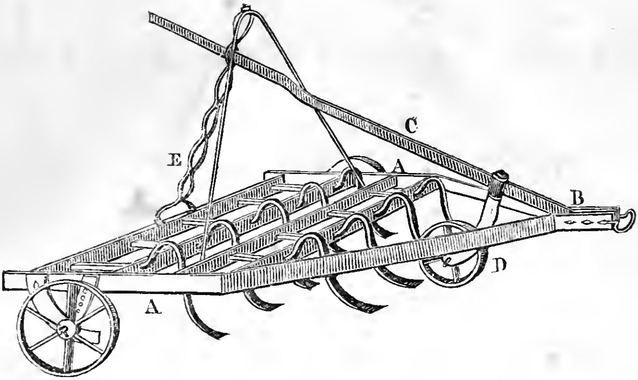

The Grubber.—This Engraving should have been inserted in page 435, but we were not able to procure it in time from the Engraver.

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