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ESSAYS

DESIGNED TO ENCOURAGE THE PURSUITS, AND
PROMOTE THE SCIENCE OF AGRICULTURE.

BY LEONARD E. LATHROP, ESQ.

INDUSTRY IS MOST EFFICACIOUS WHEN AIDED BY SCIENCE.

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**SECOND EDITION, CORRECTED & ENLARGED.**  
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DISTRICT OF VERMONT, TO WIT:

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JESSE GOVE,

Clerk of the District of Vermont.

A true copy of record, examined and sealed by me,

J. GOVE, *Clerk.*

PREFACE.

IN most countries, where the arts of civil life have reached any considerable degree of improvement, practical farming has been studied as a science ;—and books innumerable have been published upon the subject in almost every language ; yet, in the United States of America, the great business of making the most of the labors of the field has been imperfectly understood. Those periodical publications, which have often issued from the press, containing useful information on agricultural subjects, have not been rendered permanently useful, by selecting and comprising them in a volume, except in a few instances.

One object of the following essays is to explain some of the fundamental principles, which relate to agricultural science. Another, and perhaps not the least important one, is to awaken a spirit of inquiry, and invite the attention of our citizens to those pursuits, which are indispensable in the attainment of agricultural improvements.

In every part of the civilized world it has happened that the disposition to consider the business of agriculture as a mere menial employment, suited only to the lowest class in society, or to slaves, has been in proportion to the progress of science, and the arts of civil refinement. The indulgence of this disposition is too conspicuous in the character of our citizens. But it is hoped and believed by many, that a different tendency

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might be given to it, by a system of national education, discipline and laws. This however, can never be expected, so long as the knowledge and the practice of agriculture are, by force of public opinion, considered degrading and unworthy the efforts of intellectual capacity.

Although agriculture, as an art, has engaged the attention of mankind from the earliest ages, yet at this advanced period the farmer may be considered as remaining without fixed principles for regulating his practice in many important branches of his business. Writers on this subject have too often amused their readers, by publishing opinions founded solely in speculation; without reflecting that every kind of theory which has not extensive practice and observation for its basis, is preposterous and absurd. It is equally so, too, for the practical farmer to pretend that from one successful result of a simple operation, he can furnish a theory which should be considered invariable and uniform in its application. The various opinions, founded solely on practical knowledge, are often the result of correct and judicious observations; but when the same operations terminate in a different result, then it is that the philosophy of nature becomes necessary to explain the reason and the necessity of changing those opinions, and of accommodating practical means to a change of circumstances.

The business of agriculture depends on a greater variety of knowledge and experience, and requires much more judgment and discretion, than any art or trade which pertains to manual labor. The great variety of the properties in different soils, the perpetual changes of the weather, and the seasons, as well as many accidents, must continually vary its operations to render them successful.

It is the duty of patriotism and philanthropy to investigate those means which may, under all circumstances prove most efficacious to the labors of the husbandman.

It is an error to indulge an opinion that the knowledge of these means is to be acquired only by practice ; and that the most perfect acquisition of it, may as well be reserved to that period of our history, when it shall be rendered necessary by a crowded population.

Under the influence of this error, and of that indisposition to laborious pursuits, so predominant in the human character, we suffer a great portion of our republic, which is said to be improved, to remain but a barren waste ; and under this influence, too, we are forming habits which are to direct the destinies of generations yet unborn.

It is one great object of the following essays, to stimulate to those efforts by which the quantity of productive and fertile grounds may be increased. But this cannot be effected without improving the general system of agriculture ; without increasing the physical energies of our citizens, by engaging a greater proportion of our population in the business of husbandry.

It is not believed that an improved state of agriculture would produce the means of indolence, or even of leisure ; but that it would require more labor, while it would render industry more efficacious. The particular mode of cultivating the various fruits of the earth, adopted by the American farmer, has generally been the result of his observation and experience. The remarks therefore, which are made in the following essays on that subject, are intended only as references to those practices in which there has been found the greatest union of opin-

ion; and to explain those circumstances which often create diversity of opinions among intelligent farmers, so as to reconcile them if possible; for, it is certain that this diversity does exist among cultivators of the soil in the same vicinity, although the laws which govern the vegetable creation are as uniform and unalterable as the progress of time. In the hands of one person, a plan will succeed; in the hands of another, it fails; a knowledge of the causes of these different results constitutes the basis of agricultural science. It has been found necessary from the limited extent of the work, to confine the subject to remarks which relate only to some of the modern modes of improving land, and of producing those crops, and rearing and improving those animals, which have hitherto been considered most useful. It is not intended to amuse the speculative theorist, but aid the practical farmer in his pursuits. Those gentlemen, both in Europe and America, who have made efforts in modern times to improve the science of agriculture, have generally received no other compensation for their services, except what individuals have been pleased to bestow on them as the reward of their industry. Should the author of the following essays not receive even the reward which may be due to his industry, yet he hopes he may enjoy that gratitude from the public, to which he thinks he has a just claim from the effort he has made to encourage the pursuits, and promote the science of agriculture, although it should be found inadequate to his design.

THE AUTHOR.

CONTENTS.

INTRODUCTORY ESSAYS.

1. Remarks on the general condition of Agriculture in the United States.
2. The dignity and importance of Agricultural Pursuits must direct the policy and manners of the people, to secure the perpetuity of our civil privileges.
3. On the utility of the importance of studying Agriculture as a science.

AGRICULTURAL ESSAYS.

1. Nature and constituent properties of the Soil.
2. Nature and efficacy of the different Manures, and the best mode of preparing and applying them.
3. Improvement of Land by breaking up old Grass with the Plough.
4. Improvement of Lands by Ploughing and Harrowing.
5. Rotation of Crops as a substitute for Summer Fallow.
6. Soiling, its origin and advantages.
7. Advantages of the Roller.
8. Culture of Wheat.
9. Culture of Rye.
10. Culture of Indian Corn.
11. Culture of Oats.
12. Culture of Flax.
13. Culture of Hemp.
14. Culture of Turnips.
15. Culture of Potatoes.
16. Culture of Hops.
17. Culture of Artificial Grasses.
18. Buckwheat.
19. Peas.
20. Culture of Fruit Trees.

21. Making and improving Cider.
22. Economy of managing Wood Land so as to make durable provision for fuel.
23. Fences.
24. Teams.
25. Horses.
26. Neat Cattle.
27. Nature and management of the different kinds of Sheep.
28. Rearing and management of Swine.
29. Management of Bees.
30. Insects.
31. Practicability of fertilizing the barren Pine Plain Land.
32. Management of a Dairy.
33. Poultry.
34. Improvement of Bog Meadows.
35. Flooding Land.
36. The Horse Rake.
37. Horrows and Harrowing.
38. The Plough.
39. Ploughing.
40. Weeds.
41. Economy of saving Straw.
42. Gypsum or Plaster of Paris.
43. Remarks on the effects of different shades on Vegetation.
44. Advantages of Experiments.
45. Account of a Cottager's cultivation—shewing how great profits may be obtained from a small piece of Land.
46. On the culture of Gardens—and its advantages to every class of citizens.
47. On the management of the Bee.
48. The advantages which accrue to the State and to individuals from the culture of the Bee.
49. Manufacture of Metheglin.
50. Manufacture of Mead.
51. Threshing.
52. General remarks on the objects of improving our Agricultural Economy.
53. Manufacture of the sap of the Maple.
54. Fining Maple Sugar.
55. On Sowing.

INTRODUCTORY ESSAYS.

REMARKS ON THE GENERAL CONDITION OF AGRICULTURE IN THE UNITED STATES.

THE cultivators of the soil in the United States, may be divided into four classes: the great farmer, as he is usually called, who improves from two hundred to one thousand acres of land; the common farmer, who cultivates from fifty to one hundred and fifty or two hundred acres; the third class is made up of professional men, mechanics and traders, or speculators, who live in the country, and do not make the business of agriculture their principal object, but calculate to derive from it some profits which may contribute to their living; and the fourth, of those who cultivate a garden only. Among all these, but few are willing to be confined exclusively to the employment of cultivating the soil; but would pursue some speculative object by which they may gain something without earning it. The science of agriculture can never be expected to arrive to its most perfect state, unless individuals will make it an exclusive object of pursuit. In the United States, where every man is at liberty to pursue any and every sort of business, by which he would improve his condition, any legislative regulation which would controul this liberty, would be considered an infringement of our natural rights, and could not be enforced. The wisdom of individuals, aided by the influence of public opinion, may coincide, so as to make some of our citizens exclusively agriculturalists. The great farmer, to increase his wealth, too often calculates more on the number of acres which he may possess, than on his efforts to increase their productive powers; and would sooner engage in any speculation, by which he might increase the dimensions of his farm, than bestow his labor in useful improvements on the land he already possesses, and which might increase the quantity of those productions, without which the soil is of no value. We often see a farmer

who pretends to cultivate from three to five hundred acres of valuable land, manage his business with so little economy, that he barely obtains from them, after defraying the necessary expences of cultivation, produce enough to afford a scanty subsistence for himself and family. Cincinnatus, the noble Roman, got as much from his six acres: and some few farmers in our own country obtain as much produce, from their industry, on fifteen or twenty acres. Those who would justify such a system of economy, often direct their conduct by the calculation that no efforts to increase the products of the soil, are useful, beyond what may be necessary to procure a living, unless the market is such as to afford great pecuniary encouragement for surplus produce; and, to obtain money, will neglect their agricultural interests to pursue some visionary and hazardous speculation. It is a truth, which reflects dishonor upon the character of our republic, that while paupers and idlers are every where multiplying through our country, we may see, in almost every section of our territory, large tracts of land which present to the eye nothing but a barren waste. The population of the United States is but about the same as that of Great Britain and Ireland.* Ours at the present time occupies about ten times the extent of territory, exclusive of Louisiana. Can this be consistent with sound policy, or the interest and happiness of individuals? Notwithstanding a few of our citizens may have accumulated greater estates, by this prodigious and rapid extension of our settlements to the west and south, it is very certain that the people generally, might, by a practical use of agricultural science, at this time, have been as wise and happy within the limits of the Atlantic States, as they now are, scattered over a million of square miles. It is said that we have already more surplus produce than we can sell, and it will be soon enough to provide for the evils of a crowded population, when they begin to press upon us. But it should be considered, that by directing our pursuits too much to other than agricultural objects, our national habits and manners may become so degenerated, and our prejudices so established, that we shall have no disposition to return to the innocent and honest business to which we were destined by nature. Will not Americans be admonished by the examples of the old world, which have passed and are passing in awful review before us? Through all the kingdoms and empires of the east, which have risen, flourished and fell, and which are now hastening to ruin, it is not probable, from the best calculations, that more than about

*According to the census of 1820.

one sixth part of their populations are employed in cultivating the soil, while beggars and paupers, who are supported at the public expence, swarm through their vast dominions, millions of acres of their valuable lands lay uncultivated and unimproved. This disposition in the American people to enlarge their territory, rather than improve in a proper manner that which they already possess, appears to be a natural inheritance from our ancestors, the English. The British nation have ever appeared to estimate manufactures and commerce of more importance than agriculture. Hence it has been truly said they have been "more desirous of gaining new territories, than improving what they already possessed, and that millions were expended" by them, "in defending and improving distant colonies, when a small part of that money would have rendered every part of their island like a garden." It might appear almost incredible to Americans, that "Hanslow heath, a mere desert of five miles extent, covered with black furze, is almost destitute of cultivation and of habitations; only a few sheep to be seen, here and there grazing upon it; and but for the constant travelling and the absence of trees, it might be taken for a part of an American wild. Yet the whole of it is within ten miles of the Capital.* This disposition in the American people, which has so conspicuously characterized them ever since the establishment of our republic, is an error, and ought to be exploded. The great farmer should be induced to make agriculture his only business, and to study it as a science, from motives of the purest patriotism. "Whoever could make two ears of corn or two blades of grass grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together." It is the principal duty of Statesmen to dispose of the public revenue, as will best promote the enjoyment of our national rights, and those of individuals who constitute the republic; but the amount of the public revenue, as well as its very existence, depends more on the private efforts and the wisdom of individuals, especially on those of the farmer, than on the political conduct of any administration whatever. The great farmer, by solid and lasting improvements in the productive powers of the soil, may increase the most valuable resources of the country, while at the same time he will furnish bread and employment to the unfortunate poor, and save them from the miseries of pauperism. These remarks are not only applicable to the great farmer, but to those of every description, who occupy lands

* See Silliman's Travels, v. 1. p. 167.

which they neither improve themselves, or will permit them to be cultivated by tenants or hired servants. It is very certain that the evils of a crowded population have never yet been averted in any country to that extent which the science and the practice of agriculture would admit. It is reserved for the American people to evince, by experiment, whether the Creator of intelligent beings, will destine them to propagate on a spot of earth which cannot be made to produce nourishment sufficient to afford them a comfortable subsistence. And although the result of this experiment must be reserved for our posterity, at some very distant period of our history, yet it is the duty of the present generation to prepare the way, by directing our pursuits to that object, in the formation of our national habits, manners and prejudices; and not like England, employ only one sixth, but nine tenths of our population, in practical agriculture, and make the study of it the most important, the most necessary, and the most fashionable among the sciences.

THE DIGNITY ADD IMPORTANCE OF AGRICULTURAL PURSUITS MUST DIRECT THE POLICY AND MANNERS OF THE PEOPLE, TO SECURE THE PERPETUITY OF OUR CIVIL PRIVILEGES.

The pursuit of national objects, is directed by the influence of public opinion; and it is by this influence that habits prevail which eventuate in the formation of national character. In every country which has been called civilized, the splendor of wealth has engaged the attention of vulgar minds, and attached to its possessor a superiority to which merit or talents could have no claim. This senseless admiration of the show and parade of wealth, has been too much encouraged, by the influence of public opinion, in states which have been reputed to be virtuous and free. The possession of wealth does not necessarily tend to improve the virtues or capacities of men; these are to be improved by the pursuits and the exercises in which they are engaged. Hitherto a large portion of the American people have been amused with the idea that the duration and perfection of political happiness depend entirely on a free constitution written on paper. But many have ever believed, that when the

manners of the people arrive to a certain degree of degeneracy, the laws which have usually governed human actions and passions will decide its fate; and that such a state of degeneracy can be prevented only by habits of industry in the pursuit of objects, best calculated to meliorate the human condition. Should our republic exhibit the phenomenon, which has never yet been exhibited in the civilized world, that of a nation of husbandmen making commerce and the mechanical arts wholly subservient to the interests of agriculture, and enforcing upon our citizens, as it were by a national discipline and the influence of public opinion, habits of rigid temperance and industry, we might indulge more sanguine hopes of its immortal duration. History, that monumental record of national rise and national ruin, has taught us that through every stage of civil society, the miseries attending the condition of man, have been accumulated, in proportion to their neglect of the peaceful and happy employment of cultivating the earth. It has been justly remarked by one * who has heretofore directed the destinies of our country, "that God has made the breasts of those that labor in the earth his peculiar deposit for substantial virtue; the focus in which he keeps alive the sacred fire, which otherwise might escape from the face of the earth: that corruption of morals in the mass of cultivators is a phenomenon of which no age or nation has furnished an example; it is the mark set on those, who, not looking up to Heaven, to their own soil and industry, as does the husbandman, depend for it on the casualties and caprice of customers: and that the proportion which the aggregate of the other classes of citizens bears, in any state, to that of its husbandmen, is the proportion of its unsound to its healthy parts." The voice of reason and nature confirm the truth of these remarks. There is no occupation which, like agriculture, contributes to the health and energy of the human constitution; and when attended to as a science, it presents a vast field for the display of intellectual improvement and philosophical investigation. The mechanical arts, such as of masons, carpenters and smiths, particularly, are necessary, not only to aid the farmer in the progress of his occupation, but contribute essentially to his convenience and comfort. But a small proportion of this class of citizens, are however sufficient for all the necessary purposes of their respective arts. It is very obvious that without the plough, the hoe and the harrow, the productive powers of the soil would never have been developed in any degree adequate to the great objects of civilization, and of improving the

* Jefferson, late President of the U. S.

natural condition of man. But in the invention of these arts which were necessary to improve the science of agriculture, mankind were gradually led to the discovery of those which increased their riches; and when by the acquisition of a surplus of the produce of the earth, and the introduction of commerce, money was invented as the representation of property, and by that means it was found practicable to purchase not only the necessities but the conveniences of life, the natural indolence of the human disposition began to yield to the fascinating charms of luxurious ease. According to the christian chronology, it was more than three thousand years from the creation of our world, before the use of silver and gold metals were introduced as a circulating medium, and a substitute for the value of property; during which period empires rose, and flourished, and fell. It would be a curious subject to investigate the history of the origin and use of money, and its progressive influence on the manners of civil society. But for any important practical use to Americans, in their present condition, it is sufficient for them to learn whether its present use, or the means which are practised to accumulate it, have a tendency to advance our political happiness, or to perpetuate the duration of our own republican privileges. If the great object of accumulating money is not to meliorate the condition of our country, by facilitating the means of subsistence generally, and making our citizens wiser and better, is it not questionable, whether the increase of our money capital, and our population, will essentially advance the happiness, and the durable strength of our republic? It has been remarked that the strength of a nation is derived from the character, not from the wealth, nor from the number of its people. And of the truth of this remark, ancient Sparta has furnished us with an example. The republic of Sparta, after Lycurgus had suppressed the circulation of gold and silver coins, and introduced money made of iron, as the only circulating medium, and enforced by law such a distribution of property that there were no citizens either rich or poor, and with a less population than the surrounding nations, flourished for ages, the most powerful and happy republic of Greece, and perhaps of any other that has ever existed. The object of the celebrated institutions of Lycurgus was to make her citizens powerful and happy, by making them wiser and better; by improving their manners and habits, rather than by accumulating their wealth, extending their dominion and increasing their population. And Americans should not forget that the policy of Lycurgus, so far as it related to the importance of forming the habits of our citizens to industry, and their mor-

als to virtue, in establishing a national character, was enjoined on us by the advice, and exemplified in the character, of our Washington. When on the occasion of his inauguration to the office of our first chief magistrate, he admonished them to honor the men who with their own hands maintain their families, and raise up children who are inured to toil, he doubtless saw in this class of citizens the surest pledges of their welfare, and the permanency of our privileges. This remark of our illustrious chief was a salutary reproof to that class of overgrown planters and farmers, who would degrade the condition of the laboring husbandman to that of the slave. In giving lessons to posterity, his exalted policy was not influenced by partial views or personal motives; by the pride or prejudices of the world. In the experience of a life devoted to the welfare and glory of his country, he found in the employment of agriculture, the best resources of individual happiness and national prosperity. But although there have been characters renowned for wisdom, for intellectual capacity, and for patriotism, who have in every age and country, been disposed to raise the dignity and improve the science of agricultural pursuits, yet, strange as it may appear, in Republican America, to labor in the field is unfashionable! Cincinnatus was called from the plough to direct the destinies of an empire, that gave laws to the world; and to the proffers of unbounded wealth, and the splendors of ambition and of power, preferred his cottage and the cultivation of his little farm; yet among Americans, a large class of our citizens, who would claim the exclusive right to the title of gentlemen, would think it degrading to their dignity to be found, as the deputies of the Roman senate found Cincinnatus, holding the plough and dressed in the mean attire of a laboring husbandman! In republican America, too, many of our sons and daughters would excuse themselves from honest industry, because it is supposed to be unworthy of the capacity improved by science. But Americans should not forget what the lessons of history and experience have taught, that degeneracy of morals and manners has invariably originated in that class of citizens who have shunned honest industry as degrading; and that when that class becomes so numerous as to controul the current of popular opinion, the ruin of political happiness and of liberty is inevitable. If then we love our country, and would transmit to our posterity the blessings we enjoy, we should adopt the advice of our greatest political benefactor, honor the men, who with their own hands maintain their families, and thereby render agricultural pursuits popular, render them fashionable, and raise them

to that dignity, to which they should be elevated, and to which they must be elevated, to preserve the happiness and secure the permanency of our republic.

ON THE UTILITY AND IMPORTANCE OF STUDYING AGRICULTURE AS A SCIENCE.

Since the science of Chemistry has become fashionable, and been considered one of the most useful and important sciences, agriculture has derived from it, improvements which could be obtained from no other source. The great object of agricultural chemistry is, to explain all those changes in the arrangements of matter, which are connected with the growth and nourishment of plants; the constitution of different soils; and the manner in which lands are enriched by manure, as well as the particular manner in which they are rendered more fertile by the various modes of cultivation. This knowledge is highly useful to the practical farmer, by furnishing him with simple and easy experiments for directing his labors, and enabling him to pursue a certain and systematic plan of improvements; and it will be found not only useful, but indispensable in its application, in most if not all his practical experiments. Every intelligent farmer, who can read our language, may obtain enough of this science, to render his labors more easy and more efficacious. The connection of chemistry with agriculture, is not founded on uncertain speculations, but furnishes principles which must be understood and followed, to insure to the practical agriculturist any considerable degree of success. It is an erroneous opinion, which extensively prevails, that the science which may be efficacious in its application to the culture of a particular soil and climate, cannot be so, also, to that of others. The principles of agriculture are uniform and universal in their operations; and it is the business of the intelligent farmer to vary the application of them, according to the nature and condition of the soil he cultivates. There is in every climate some soils to be found which contain an excess of some of the original earths, of sand or clay, for instance. A chemical analysis of the soil, has proved what proportions of these are most conducive to fertility; and when proper proportions of each cannot be

procured, what other substitutes may prove most efficacious. Sir Humphrey Davy, in his introduction to agricultural chemistry, remarks, that some lands of good apparent texture are yet sterile in a high degree; and common observation and common practice afford no means of ascertaining the cause, or of removing the effect. The application of chemical tests in such cases is obvious; for the soil must contain some noxious principle which may be easily discovered, and probably easily destroyed. One of these noxious substances, which such a soil may contain, is the salts of iron. This, chemists have discovered, may be decomposed or destroyed by lime. But this defect in the soil, or the remedy, might not be discovered by the practical farmer in five hundred years. This is only mentioned as one of the numerous instances which may convince us, that the farmer, without any knowledge of agricultural chemistry, might lose a great proportion of the profits he might derive from his labors. Industry, in any lawful pursuit, is more efficacious when aided by science. While the practical farmer is ready to acknowledge this, yet many of them will say that the knowledge they derive from experience is most correct, and sufficient for all the more important purposes of agriculture. It is true some of the most valuable acquisitions of this science have been developed by the practical discoveries and improvements of the husbandman. But the progress of knowledge in this science has, like that of all others, been gradually acquired. And it is easy to conceive that many useful discoveries, made in one period of time, when consigned to no other record but that of tradition, may be lost, even to the succeeding generation. It is a well attested fact, that but about forty years ago, the farmers in many parts of the New-England States, had imbibed an opinion that wheat could not be cultivated to advantage, except on land newly cleared; and actually procured that article for their consumption, principally from the new settlements at the north and west. They were generally ignorant of the means of reviving an exhausted soil and of fertilizing it by cultivation. Even the improvement of the soil by stocking it with clover, is of recent date: although it was then, as it now is, a well attested fact that the soil of Great Britain, the native country of their ancestors, has been increasing in fertility for more than five hundred years. It is not strange that much of the agricultural science known by the ancient or modern Europeans, should be lost to their descendants in this country. Surrounded as they were by savage tribes, they had enough to do for more than half a century, to provide for their personal security and defend themselves against the horrors of cold and hunger. Their condition would

not indeed admit of the practice of that science necessary to an improved state of cultivation. But it is very obvious that had they preserved records of it and assiduously improved them, as they probably did those of many others less interesting, it would have greatly meliorated their condition.

The knowledge of the mechanical arts, and indeed the whole science of civilized man, has been the result of the progressive improvements of individuals; the aggregate of their discoveries has contributed to these improvements, and has at last, and after a long succession of years, resulted in the knowledge of the various arts and sciences which have distinguished the civil from the natural state. The mechanical arts depend on certain fixed principles, and are performed by simple and uniform operations; whereas the business of husbandry is to be directed according to every change of weather, and the great variety of the properties in different soils; and also many accidents which must continually vary its operations, to render them successful. From these and various other considerations, it is, that a competent knowledge of the science should embrace the experience and the philosophy of the whole age in which we live. The improvements which have been sometimes made in our country, and which are supposed by many to have resulted from recent discoveries and observations, are found, on examining the history of the science of agriculture, to have been practised hundreds of years ago; and the knowledge of them but recently developed to us, by that spirit of enquiry which the combined efforts of a few individuals has inspired. But the efforts of a few individuals to promote the science of agriculture, cannot be extensively and permanently useful, unless our farmers generally believe in its importance. And there is among our citizens, a disposition too prevalent, to treat every proposition for improvement as chimerical, or a useless innovation. This disposition is not unprecedented. Instances enough might be adduced in which error has been venerated for its antiquity, while truth has been discarded for its novelty. Even in this enlightened republic, this age of reason and philosophy, the first efforts for the abolition of any popular custom, however absurd, are often charged with the epithet of a visionary project. But those who would estimate the correctness of their habits and their prejudices by the antiquity of their origin, or are willing to limit their knowledge to those improvements which are the result of their own personal observations and experience, should be reminded that the idea of treating agriculture as a science, and of improving its condition, by collecting and recording the

precepts and discoveries which relate to it, is not a new one. Three thousand years ago, the Greeks, whose wisdom and whose science gave to the nature of man a new and distinguished lustre, considered that the business of agriculture could not well succeed and progress towards perfection, without a knowledge of those precepts which had resulted from a long series of observations and experiments, which should embrace the philosophy and the practical discoveries of the whole age in which they lived. Several writers among that illustrious people, employed themselves in collecting such precepts, and recording them for their own improvement, and the benefit of their posterity. Several of their celebrated philosophers, as Demacritus, Archylas, and Epicharmas, left useful instructions on the subject of agriculture; and many ages before them, they had been sung by Hesiod, in one of his poems. And many of those precepts were transmitted through successive generations to our ancestors. Whatever knowledge of those precepts is possessed by their descendants, the farmers in the United States, has generally been acquired by either tradition or observation. Traditions, it will be acknowledged, are often founded in error, and the evils resulting from them descend from generation to generation. The observations and successful experiments of intelligent farmers, it is evident, cannot be extensively communicated to others, but through the medium of the press. Such is the condition of many young gentlemen, when they commence the business of agriculture, that they have to depend for their knowledge on their own practical experiments: to acquire this so as to render their labors most efficacious, may, and often does, require the greatest and best part of their lives; when by a very little expense of time and money, they may learn from books what have been the results of the most important experiments in the history of agricultural science. It is very obvious, then, that the maxims and principles which relate to it, should be correctly recorded and studied, as other sciences. The innumerable volumes that have been written upon this subject, among the wisest and most learned nations, may convince us that it has been so considered by them, and not regarded as a matter very easily understood. But the great mass of our common farmers, whose minds are not much enlightened by general science, cannot expect their occupation will ever be elevated in public opinion, to that dignity among the employments of men, which it ought to sustain, so long as they are disposed to treat it as a mere menial exercise, and unworthy the efforts of intellectual capacity. The knowledge which gives man his supremacy

over the beasts of the field, and the fowls of the air, and which bestows on individuals among mankind, a pre-eminence more substantial and less invidious than birth, wealth, titles, or popular applause, can be acquired only by three modes, observation, conversation, and reading. Although observation and conversation are fruitful resources for the attainment of useful ideas, the impressions they make are but transient, and when committed to no other record but that of the memory, cannot be rendered permanently useful. But when a useful discovery or improvement in agriculture, as well as in any other occupation, is committed to the press, and by that means preserved, they may thereby become extensively useful, not only to our citizens generally, now on the stage of life, but to remote posterity. Many of the sciences are industriously pursued, and considered as objects worthy of great attention, on account of the intellectual pleasure they afford, and because they enable us to extend our views, and to reason more correctly concerning the objects which surround us. But the discoveries in the cultivation of the earth, are not confined to the time and country in which they are made, but may be considered as extending to future ages, and intended to meliorate the condition of the whole human race, and providing subsistence and enjoyment for generations yet unborn.

AGRICULTURAL ESSAYS.

NATURE AND CONSTITUENT PROPERTIES OF THE SOIL.

It has been discovered by chemists, that the soil from which we derive our subsistence, is composed of several simple substances, to wit, sand, clay, lime, and magnesia. But with respect to the original uncompound earths, there has been a diversity of opinion: some of the ancient philosophers supposing that matter is the same in essence, and that the different substances, considered as elements by chemists, are merely different arrangements of the same indestructible particles; that the varieties of the principles to be found in plants may be formed from the substances in the atmosphere; and that vegetable life is a process in which bodies that the analytical philosopher is unable to change or to form, are constantly composed or decomposed. An opinion has prevailed that loam is also an original earth; but it is believed that the evidence of its being merely an artificial soil, produced by calcareous matters and animal and vegetable manures, must preponderate against every opinion to the contrary. In the improvement of agricultural science, it is sufficient for the practical farmer to know that the most fertile soil contains the greatest quantity of sand and clay for its constituent ingredients, with a due proportion of each; and that all other earthly substances are to make up the other constituent ingredients of such a soil, by a judicious application of them, as manures. Every soil in a productive state, has been found to contain at least three of these simple substances, or different kinds of earths, to wit, sand, lime, and clay, and sometimes, also, magnesia. It has been found also, and perhaps generally known by practical agriculturalists, that soils retain moisture longer or shorter, according to the proportions of these

earths. Those which contain the greatest quantity of sand, retain it the shortest; and those which contain the greatest quantity of clay, retain it the longest. The first is a dry, the second a wet soil. Lime and magnesia are intermediate between these two extremes. They render a sandy soil more retentive of moisture, and diminish the wetness of a clayey soil. By mixing together therefore proper proportions of these four earths, we may form a soil of any degree of dryness or moisture, which can be effected by human agency. The degree of its moisture must ultimately depend on the quantity of rain which falls; though it will be seen from what has been discovered, that in certain soils, the farmer may, by apportioning the different constituents of his soil, in some degree, mitigate the evils which otherwise might result from extraordinary degrees of drought and moisture, occasioned by the diversity of the seasons. It may be considered a fundamental principle in agricultural operations, that the four simple substances which have been mentioned, do not constitute a fertile soil, in whatever proportions they may be mixed. This has been proved by various experiments. Among others, Giobert mixed together the four earths, sand, clay, lime and magnesia, in the proper proportions, to constitute a fertile soil; and after moistening them with pure water, planted several vegetables in them; but none of them grew well, till he moistened his soil with water from a dunghill. Lampodius planted different vegetables in compartments of his garden, filled each with only one of the pure earths, and watered them with the liquor which exuded from a dunghill. They all grew, notwithstanding the diversity of the soil. From the experiment of Giobert, it appears that the pure earths cannot be mixed so as to make a fertile soil, without the application of vegetable manure;* and by that of Lampodius, that by an application of a suitable proportion of this manure with either one of the simple earths, a productive soil may be created. It would perhaps be a useless effort of the philosophic mind, to inquire respecting the origin of the first fertilizing principle which produced the forests which generally cover the earth in its primeval or natural state. It is sufficient for the practical farmer to know that their foliage is continually deposited on the surface of the earth, and that the fertility of the soil is thereby increased. And if by cultivation we would create or continue that fertility, we must by industry endeavor to imitate the operation of nature, by restoring to the soil that

* By vegetable manure is understood every vegetable or animal substance, in a decayed or decomposed state.

necessary ingredient of its fertility which the vegetative principle has provided. But it is of great importance to learn what proportions of the simple earths and vegetable manure are requisite to create a fertile soil. Much useful information on this subject may be derived from the result of a late investigation. A quantity of soil, of a supposed average quality, was taken from a farm in the vicinity of Albany, in the State of New-York; and on being analyzed, was found to be composed of the following constituent substances:

Sand,	-	-	-	56-100ths.
Clay,	-	-	-	26-100ths.
Vegetable manure,	-			12-100ths.
Soluble Salts,	-	-		6-100ths.

The farm containing this soil is supposed to be one of the most productive in the northern states. It should be here remarked, that salts soluble by water, in greater or less quantities, are one of the necessary constituent ingredients of plants. With respect to the practical use of the above analysis, it may be observed, that in every part of our country where any considerable improvements have been made, there are many tracts of land which are barren beyond what the general complexion of the soil would indicate, and which cannot be made fertile by the application of any vegetable manure which can be obtained. In many of those soils it will be found that the defect may be the want of a proper apportionment of the primitive earths. For, from what has been asserted and proved too, by actual experiment, it is evident there may be such great proportions of some of the primitive earths, in some soils, as to render them barren, without the application of more proper manure than the occupant can procure: when by increasing the quantity of some of the primitive earths, a great degree of fertility may be produced in some soils, with the application of but a very small portion of vegetable manure. Suppose, for instance, the soil of the farm, the analysis of which has been given, had consisted of 62 parts clay, and 20 parts, instead of 56 parts, sand, and 26 clay; the inference is very obvious that the 12 parts of vegetable manure, which was found in that soil, would not have rendered it fertile, as it was, unless the proportion of the sand to the clay had been greatly increased. May we not then conclude from that analysis, that the proper apportionment of the sand and clay, had as important an agency in the fertility of the soil, as that of the vegetable manure? For although it would seem from the experiment of Giobert, referred to above, that the primitive earths are not productive without the application of vegetable manure; yet it is found, also, by experiment, that

vegetable manure, of itself, cannot be rendered productive without the agency of some of the primitive earths. From what has been disclosed on this subject, the intelligent farmer may be convinced that a mixture of the primitive earths, as well as the application of vegetable manure, is indispensable to the fertility of the soil. It is very evident too, that the proportion of these several ingredients of a fertile soil must be somewhat varied, according to the climate. In a very warm climate, on a soil composed principally of sand, the expediency of applying clay, when it can be had, as well as a due proportion of vegetable manure, is obvious. As it is of great importance in a judicious system of farming, to learn the condition of the natural soil, or the apportionment of the simple earths which constitute it, the following remarks of a distinguished agriculturalist, more fully explain the principles which relate to it, and are of too much interest to the farmer to be omitted: "The obstacles which baffle the hopes of improvement are just as likely to lie in the subsoil which is placed beyond the reach of the ploughshare, as in the upper surface, which is more immediately subjected to culture; and for this reason neither of them ought to be disregarded. A coat of stiff clay has been rendered productive by the mere circumstance of resting on a bed of sand, or a rock of limestone; and therefore, every cultivator, if he would pursue a successful course, should (if he finds invisible defects in his soil which defeat his efforts) dig pits in various places of it, at least eighteen inches down, that he may discover the materials on which he is to operate. The subsoil may furnish him with the means by which to meliorate the surface. Clay, called in agricultural publications, alumine, or argillaceous earth, is a substance so familiarly known that it needs no particular description. When pure, it is white; but in general it is found discolored by the mineral waters, which are perpetually escaping from their beds and running on the surface. It is tinged with blue, brown, grey and red shades, for it has a strong affinity to all coloring matter. As an ingredient of soil, it has the four following properties, by which it exerts a powerful effect on vegetation: it absorbs water like a sponge, and is so close in the texture, as to prevent it from filtrating through its pores. When thoroughly soaked and afterwards dried, it hardens and cakes into a solid mass. It shrinks considerably in bulk when exposed to heat, and the contraction of its parts is in proportion to the intensity of that heat. It powerfully retards putrefaction, by enclosing animal and vegetable remains, and thus shutting out the dissolvent action of the external air.*

* Mr. Davy, in his elements of agricultural chemistry, remarks,

The roots, which are the collectors of the nutriment, and are withal of a tender and delicate texture, cannot easily stretch themselves in a substance of such stiffness and tenacity; and which besides, so readily consolidates after rain into a compact body. Its closeness opposes material resistance to their extension, and accordingly in its unmellowed state, the fibres are hampered from extending themselves. Besides, admitting that they overcome in part this obstacle in the soil, they must, whenever it hardens in the sun and gapes into chinks, be violently torn asunder and separated from the stem. If clay be so hurtful on the surface, it is almost equally pernicious in the subsoil, from the capacity it has of interrupting the passage of water downward, and keeping the roots perpetually drenched, an evil no less destructive to the health and vigor of the plant than the opposite extreme. All its qualities are unfriendly to vegetation, except its capacity of absorbing and retaining moisture, and this is of so much importance, as in some measure, to make atonement for its other defects. When existing by itself, this virtue which it possesses in so eminent a degree, is useless and unavailing; but when mixed with other materials, of a loose and friable nature, it gives tenacity and firmness to the whole, and is highly retentive of the dews and rains which fall to fertilize the soil. Sand or gravel, called sometimes silex, silica, silicious matter, or earth of flints, is distinguished by properties of a totally opposite character. Sand is incapable of retaining water when poured upon it, and far less of attracting moisture from the atmosphere. It powerfully promotes putrefaction, but allows the gasses set at liberty, to escape. It has little or no cohesion among its parts, and never binds by the alternations of wet and dry, into a compact body. It will appear from this account of the properties of sand, that it is provided as a correcter of alumine, or clay, and that in their effects, the two are destined to counteract each other. Sand suffers water to filter easily; clay is highly retentive: sand promotes putrefaction; clay delays it, but absorbs the gasses which are formed in the decomposition: sand opens an unobstructed path for the extension of the roots; clay gives them firmness in their course, and supplies the moisture which sustains them. Thus we see, that

that one cause of the unproductiveness of cold, clayey, adhesive soils is, that the seed is coated with matter impenetrable to air, and that in clayey soils, there can scarcely be too great a mechanical division of parts in the process of tillage. And seed, says he, not fully supplied with air, always produces a weak and diseased plant.

by their union their common virtues are heightened, while their defects are rectified and subdued." It is very obvious therefore, that a mixture of those two kinds of earth will greatly increase the value of the soil. "Lime, called calcareous earth, enters into the composition of soils. This is never found in its pure state, but in combination with carbonic acid, for which it has so strong an affinity, that it attracts it from the atmosphere. It is closer than sand, and much less adhesive than clay. It occupies therefore a middle region between the two, free from their imperfections, and blending their common qualities. It is a powerful promoter of putrefaction, and helps to decompose the animal and vegetable matter lying in the soil. To this circumstance is owing in a great measure its efficacy, as a manure. It has the power of fixing and retaining a very great quantity of carbonic acid, and although it combines chemically with a certain portion, which can only be expelled by red heat, yet the excess can easily be disengaged in a low temperature, and thus tends to nourish the growing crops. This earth exists in abundance among the solid strata of our globe, mostly without any foreign mixture, except the acids with which it combines; but is occasionally blended also, with the other primitive masses. With carbonic acid it forms the most frequent compounds; denominated carbonates of lime,* and assumes a variety of appearances, and even possesses distinct properties. Spar. marble, stalactites, limestone and chalk, are all varieties of this combination. With the sulphuric acid, (which is composed of sulphur and oxygen,) it forms plaster of paris. It is also found mixed with clay, and sometimes with sand, and then receives the appellation of marble, and which is valuable precisely in proportion to the quantity of this earth." Magnesia, the last earth which has been found in soils, and that too, in a much smaller proportion than the other three, is a substance with which every farmer must be acquainted, since it is commonly used as a medicine of the shops. Its properties are nearly analogous to those of lime, and were long supposed to operate in the same way. It has also a strong, though less, affinity for carbonic acid, and often forms a constituent principle in lime-stone rock. Agriculturalists are divided at present, with respect to its usefulness as a manure. Some of them holding it to be poisonous to plants, while others support it by an appeal to experiments. But it is thought to be uncertain

* Carbonate of lime is not soluble in water, unless the water itself be charged with carbonic acid. Carbonate of lime is a compound of lime 86, carbonic acid 44.

whether our limestone contains any portion of magnesia. It is only pernicious when applied in an excessive dose; and this holds equally true with respect to lime, for these two earths should, in all cases, be used sparingly by the skilful cultivator. Loam is by no means a distinct body, possessing in itself appropriate and marked characters, as many of our farmers suppose; but is a combination of clay, sand, or calcareous matter. The diversity which exists among what are accounted loams, is a decisive proof of this; some of them we denominate clayey, from the excess of argillaceous matter; others open and light, from the preponderance of sand. Mould, as it is sometimes called, contains the putrid relics of organized substances, that have grown and decayed upon it, or have been conveyed thither in the progress of cultivation. The resident earth remaining after the process of dissolution, is extremely light in weight, and always of a blackish color. It is owing to this, that a garden which has been under long continued culture, approaches to a black tinge, progressively deepening, according to the abundance of this matter. Soils lying in the territory of an old country, are found to contain various chemical compounds, mineral salts, and metallic oxids; some of which are beneficial, others harmless, and a few injurious to vegetation; and which either pre-existed in the strata from which the surface has been formed, or have been carried to it by subterraneous springs, or by foreign causes, operating in the course of past ages. The most frequent are epsom and common salts, combinations of potash, lime and magnesia, with the acid and oxid of iron, which is just the rust produced by exposing this metal to the action of the air. It is this oxid which gives the brown and redish color, as well as the intermediate shades, to sand and clay.

It seems plain that considerable advantages may be derived to the practical farmer, from analyzing the different kinds of soils, from comparing the proportion of the earths in the productive, with those found in the barren, from studying the separate effects of these ingredients, and from all these results, deducing the most skilful plan of procedure in effectuating permanent improvements. But the usual process which the learned chemist would adopt, in analyzing soils, is too laborious and intricate for practical use to farmers in general. The following simple process is within their reach, and may lead them to adopt for themselves more accurate and perfect methods. In the field to be examined, take earth, a little below the surface, from four separate places, about 1-4 lb. avoirdupois, from each. Expose it to the sun, or before the fire, till

it is completely dry, and turn it over frequently, that it may be well mixed together. From the heap take exactly 4 ounces, and pass it through a sieve, which will allow all the particles of sand and gravel to escape, but hold back stones, small fibrous roots, and decayed wood. Weigh the two parts separately, and take a note of each. The stones and other bulky materials are then to be examined apart from the roots and wood. If they are hard and rough to the touch, and scratch glass easily, they are silicious, or flinty; if they are without much difficulty broken to pieces with the fingers, and can be scraped by a knife to powder, they are aluminous, or clayey: or if when put in a wine glass, and lemon vinegar poured upon them, small air bubbles ascend to the top of the liquid, they are calcareous. The finely divided matter which ran through the sieve, must next undergo the test of experiment. After being weighed, agitate the whole in water, till the earth be taken up from the bottom, and mechanically suspended, adding water till this effect be produced. Allow the mass then to settle for two or three minutes, and in that time the sandy particles shall have all sunk to the bottom. Pour off the water, which will then contain the clay in suspension, with the insoluble earth arising from animal and vegetable decomposition. The sand should first be attended to; and if, from inspection, it be thought either silicious or calcareous in its nature, the requisite tests may be instantly applied. By this time the mixture will have deposited at the bottom of the vessel, the clay and other earths, with the insoluble animal and vegetable matter. After pouring off the water, dry the sedement, and apply a strong fire by placing it on the bottom of a pot heated to redness, and the animal and vegetable matter will burn and fly off in uniform products. The remainder lying in the bottom, will be found to consist of clay, magnesia, and lime. To obtain accuracy, another 1-4 lb. of earth should be taken from the same heap, and the whole process gone over a second time, that the operator may rectify any blunders he had previously committed, and be satisfied as to the result of his experiments. He should provide himself with a pair of scales, and a set of weights, divided at least into ounces and drachms. Although vinegar will detect lime by effervescence, it does not dissolve it so effectually as the nitre, or muriatic acid; small quantities of which may be procured from the druggists at no great expense. The importance of sometimes resorting to an analysis of the soil, will appear, from the consideration that many soils, apparently of good texture, are yet barren in a high degree, when, as has been observed by Sir Humphrey Davy, common

observation and common practice, afford no means of ascertaining the cause, or of removing the effect. And also, when it is considered that the primitive earths, clay and sand, contain, each perhaps in nearly equal degrees, the food of plants; and that in their union, the purposes of vegetation are most completely answered. What precise quantities of each may be necessary, to make this union perfect, it is neither very easy nor very material to ascertain, since that point is best determined in practice, when the soil proves to be neither too stiff nor adhesive from the superabundance of clay, nor of too loose and weak a texture from an over quantity of sand in its composition. The medium is undoubtedly best; though an excess towards adhesion is obviously the most safe. But when, from the situation of the soil, there must necessarily be a deficiency of either sand or clay, the most perfect remedy for that deficiency, is compost manure, or decomposed animal and vegetable substances. For compost manure, whether it is made up solely of these substances, or with barn dung intermixed with them, is the product of all the nutritive ingredients which are essential to vegetation. It is therefore the most certain and durable agent in promoting fertility; and is not only the most salutary substitute for either of the primitive simple earths, but the most powerful auxiliary, to render them efficacious. It should be observed, that what are sometimes called gravelly soils, may be distinguished from sandy soils, in this, that the former is chiefly composed of small soft stones; though in some instances, the stones are of the silicious, or flinty nature, and in others, of the calcareous, or chalky. From these constitutional circumstances, arises the propriety of deepening gravelly soils by coats of marl, or keeping them fresh by frequent returns of grass, and repeated applications of manure. Like sand, they are naturally barren, unless mixed with other earths; and the surface would exhibit the same appearance as the subsoil, or what is beyond the reach of the plough, were it not changed and meliorated by vegetable manure. The constitutional qualities of gravels also point out the propriety of ploughing them deep, so that the surface of the soil may be augmented, or rather its fertility increased, by exposing the subsoil to the salutary influences of the sun and atmospheric air. Although much more useful information might be disclosed on this subject, yet enough has been said to convince the farmer, that if he would render his efforts successful, he should make the knowledge of the nature and properties of the soil he would cultivate, a fundamental principle.

FOOD OF VEGETABLES, AND THE MANNER IN WHICH IT IS COMMUNICATED TO THE PLANT.

Vegetables are probably the most numerous class of bodies which belong to our globe; more than forty thousand of the species having already been discovered, and additions are continually making to the number. It has been shown in a former essay, that no plant which we cultivate can be brought to maturity, without the nourishment derived from some kind of vegetable manure. If, therefore, we would ascertain what kind of manure is best adapted to the different plants, and the best mode of applying it, we must have some knowledge of the process by which the seed, after it is committed to the earth, germinates and progresses towards perfection. It is well known by all who cultivate the earth, that seeds of any kind will not germinate without a certain degree of heat and moisture. But we are indebted to chemists for the discovery that seeds will not germinate, unless atmospheric air, or some air having the same properties, have access to it.*

It is probable, for this reason, that seeds will not germinate at a certain depth below the surface of the earth; and for this reason, the first growth of the plant is often retarded by burying the seed too deep. Is not this fact confirmed by the observation, that the plant of any seed which we commit to the earth, has a more healthy appearance, and grows with more vigor, the sooner it makes its appearance above the surface, after it begins to germinate. As the progress of the root is downward, no injury will be likely to happen to it in seasons of common moisture, from its lying too near the surface of the soil; and by springing from the seed, which is buried no deeper than is necessary to germinate, it will be more likely to derive support and efficacy from the nourishment furnished from manure, if properly applied. That the farmer may prepare and apply his manure in the most judicious and efficacious

*On this subject Mr. Davy remarks, that in all cases of tillage, the seed should be sown so as to be fully exposed to the influence of the air; and one cause of the unproductiveness of cold, clayey, adhesive soils, is, that the seed is coated with matter impenetrable to air. That in sandy soils the air is always sufficiently penetrable by the atmosphere; but in clayey soils, there can scarcely be too great a mechanical division of parts in the process of tillage; and seed not fully supplied with air, always produces a weak and diseased plant. See his *Elements of Agricultural Chemistry*, page 191, 192.

manner, it should be considered, that whatever may be the nature of the substances derived from manure, they cannot communicate nourishment to the plant, without first going into a state of solution; and that water is the agent made use of to effect this solution. For as water has been proved by various experiments to be insufficient, of itself, to bring the seeds of any plant to maturity, while at the same time the presence of it is indispensable to carry on the process of vegetation, we are forced to conclude, that the principal, if not the sole use of it, is to dissolve all those substances which form essential parts of the food necessary to its growth and maturity; especially, since it has been well demonstrated by experiments, that all those substances may be dissolved in water. So far, then, as the food of plants is supplied by the soil in which they vegetate, it is probable that it is imbibed by the extremities of the roots only. For it has been discovered, that the portion of the soil which is soonest exhausted, is precisely that part in which the greatest number of the extremities of roots lie. By this means it has been observed, they are enabled to go in quest of nourishment, and the extremities of the roots seem to have a peculiar structure, adapted for the imbibing of moisture: although it has no visible opening, yet, if we cut it off, it never increases any more in length, and its use, as a root, is in a great measure destroyed; but its sides send out fibres which act the part of roots, and imbibe food by their extremities. This is the theory in which chemists are generally agreed, respecting the manner in which food is communicated to the plant, so far as it is supplied from the soil. Plants derive some part of their nourishment from the atmosphere. The house-leek, and some other plants, may be supported from the influences of the atmosphere alone. But the influence of the atmosphere on the vegetation of plants generally, is efficacious, in proportion to the productive power of the soil, or the efficacy derived from its fertility. From what has been observed, it will be seen that the nourishment derived from manure, must first be dissolved by the moisture there is in the soil, and after being so dissolved, must come in contact with the extremity of the roots of the plant, before it can contribute to its growth and maturity. It is not known that there is any attractive power, either in this nourishment, or in the roots of the plants, by means of which the former is communicated, so as to promote vegetation. It is obvious the plant will not flourish, unless some such nourishment may be found located in those parts of the soil to which the extremities of the roots will, in the progress of vegetation, become contiguous, or nearly so.

It is often observed by farmers, that vegetable manure, before it becomes decomposed, or reduced to a state of putrefaction, will improve the soil, though it will not contribute so much to the value of the crop the first year that it is applied. This is true; but the application of undecayed vegetable manure, such as straw, &c. spread on land, and mixed with the soil as effectually as is practicable with the plough and the harrow, in the usual manner of performing the operation, will contribute much less to the immediate value of any crop, than many farmers have believed. The following account of a celebrated author,* on the science of chemistry, developes facts, relating to this subject, worthy of consideration, and may be of much practical utility. "It appears," says he, "from the experiments of Mr. Hassenfratz, that substances employed as manures, produce effects in times proportioned to their degree of putrefaction: those substances which are most putrid, producing the most speedy effects, and of course, soonest losing their efficacy. Having manured two pieces of the same kind of soil, the one with a mixture of dung and straw, highly putrified, the other with the same mixture newly made, and the straw almost fresh, he observed, that during the first year, the plants which grew on the sand manured with the putrefied dung, produced a much better crop than the other: but the second year, (no new dung being added) the ground which had been manured with the unputrefied dung, produced the best crop. The same thing took place the third year, after which both seemed to be equally exhausted. Here it is evident that the putrefied dung acted soonest, and was soonest exhausted. It follows from this, that carbon† only acts as a manure, when in a particular state of combination; and this state, whatever it may be, is evidently produced by putrefaction. Another experiment of the same chemist, renders this truth still more evident. He allowed shavings of wood to remain for about ten months in a moist place, till they began to putrefy, then spread them over a piece of ground by way of manure. The first two years, this piece of ground produced nothing more than others which had

* Thomas Thompson.

† Carbon exists pure in the state of the diamond only. It forms a constituent part of marble, of chalk, of all vegetable and animal matter. It is the basis of charcoal. Combined with oxygen and forming a gas, it floats in the atmosphere. All the gasses which are produced when animal matter passes into a state of putrefaction, being absorbed by it, it is very important in resisting and checking the progress of putrefaction. See Eaton's Chemical Instructor, p. 108-109.

not been manured at all ; the third year it was better, the fourth year it was still better, the fifth year it reached its greatest fertility ; after which it declined constantly till the ninth, when it was quite exhausted. Here the effect of the manure evidently depended upon its progress in putrefaction.

From this account, as well as from the knowledge we may derive from our own observations and reflections on this subject, it will be seen, that the class of cultivators who depend on the immediate produce of their industry for support, err in the mode of applying, as manure, straw, or other undecayed vegetable substances. The nutritive powers of this kind of manure, contribute something to its weight, but very little to its bulk ; that may principally remain, when its efficacy in the growth of plants is entirely destroyed ; and this destruction may be effected by its being continually leached in water, by being pushed to excessive fermentation, when deposited in heaps, or being much exposed to alternations of drought and moisture.

After its dissolution, the residual earth remaining, is very light in weight, and always of a blackish color ; so that whatever may be the visible bulk of such vegetable substances, after their nutritive elements are exhausted by any of the means which have been mentioned above, or otherwise, they contain no matter essentially efficacious as the proper food of vegetables.

But the knowledge of the manner in which nourishment is communicated to the plant, is so inseparably connected with the science of preparing and applying vegetable manure, that the principles which relate to both may perhaps be better explained, by considering them in their connection.

NATURE AND EFFICACY OF THE DIFFERENT MANURES, AND THE BEST MODE OF PREPARING AND APPLYING THEM.

When the soil in the United States becomes exhausted, by too frequent cropping, or bad husbandry, as it has in some of the northern and middle states, the knowledge of the nature and efficacy of the different kinds of manure, and the best mode

of preparing and applying them, becomes important to the farmer. This knowledge was lost to our ancestors, who began the first settlement of our country. They did not need it, the land of new settlements being generally sufficiently productive for the purposes of culture. But it has now become necessary in many parts of our country; and it is fortunate for us that we have not only the discoveries of practical and intelligent farmers, but the science of chemistry, also, to aid us in the investigation of this subject.

Manures are composed of a great variety of substances, which are necessary to supply plants with their requisite food.

It has been found that even different earths will serve to manure each other. Sand will fertilize a soil that has much clay, and light sandy soil is also fertilized by clay. When clayey lands are in grass, the sand may be laid on as a top dressing; but when they are ploughed, it should be well mixed with the soil, for the purpose of lessening its adhesion. Sand which has been washed down in roads or elsewhere, is best. When clay is applied to a sandy soil, it should be carted on in the fall, and spread evenly over the ground, that the frosts may pulverize it, before it is mixed with the soil, in the spring. The better these earths are mixed in the respective soils, the more sensible and immediate will be their effects; but they differ from most other kinds of manure in this, that they are calculated permanently to improve the soil to which they are applied. Loams are also in the same way assisted by sand, and sand again by them. Sand will fertilize the soil of bog meadow, and this earth again is very good for all upland soils, but best for those which are light and dry. It has been found to be peculiarly excellent for Indian corn, when applied to the hills, and it is said to be very good also, for flax, hemp, and most other summer crops. It is also friendly to the growth of white clover. When applied to upland grasses, it should be laid on as a top dressing.

Every kind of black mud, from ponds and swamps, answers a good purpose on a light and dry soil. The different sorts of marl found in bog swamps, are also excellent manures for all upland soils. These earths are usually found from one to three feet from the surface, and are either of white, grey, or a brownish color. The former is believed to be most efficacious, and the latter the least so; their strength being in proportion to the quantity of the carbonate of lime, which they contain. It is thought best to mix these earths with the mass of black earth or bog dirt, that forms the upper stratum, in order to reduce their strength; and when thus mixed, a load of even the weak-

est kind has been found to be more efficacious than two of the common barn dung. Their operation as manures is similar to that of gypsum, having little or no effect when first applied to wheat or rye ; but by its afterwards covering the ground with a thick growth of white clover, it is then rendered fit for producing largely of these crops. They are peculiarly excellent for Indian corn, and all summer grain, and a less quantity is sufficient. They may be used as top dressings. It will be recollected that in all the older states, considerable tracts of land are frequently found to consist of these bog meadows and swamps, as they are usually called, which are often surrounded by a dry barren soil ; all of which, by applying the manures they contain, as above described, may be gradually converted into healthy and productive soils, capable of supporting thousands of our citizens, with the necessaries and conveniences of life.

ASHES, as manure, are found to be more efficacious, in some parts of the country, than in others ; most so when applied to lands near the ocean. They generally answer the most valuable purpose, when applied to Indian corn, especially on such soils as are not suitable to this plant. When the soil is wet, cold, loamy, or clayey, the plants are apt to become stunted by the cold rains, which usually fall after planting, and the ashes, in such cases, supply the natural deficiency of the soil, till it becomes fertilized by the summer sun. But when the soil is natural to the growth of this plant, and when it will not be likely to be stunted in its first growth, it would probably be better to apply the ashes later, so that the plant may derive the greatest assistance from this manure, while the ears are setting and forming. Ashes should generally be used for top dressings ; their salts lose nothing by exposure to the air, and soon find their way into the soil.

LIME is much used in Great Britain, and other northern parts of Europe, where the summers are cool, and much soil that may be called cold. It has been thought best to apply it pure to soils, or in compost, immediately after it is slacked. In stiff clays, it is found that lime would be peculiarly useful in destroying the adhesive quality of the soil. Some limestone is principally combined with argillaceous, and some with silicious earths, and some is found to contain a large portion of magnesia. The former is generally known by its hardness and smoothness of surface when broken, and is the best calculated to benefit a clay soil. The silicious limestone is the best for clay, and is most soft and of unequal parts when broken. That which contains much magnesia is found to be destructive to

vegetation. The magnesia limestone is distinguished from that which is purely calcareous, by the slowness of its solution in acid, which is so considerable, that the softest kind of the former is much longer in dissolving than marble.*

GYP SUM. The qualities of this manure are so well understood by our farmers, that a particular explanation of them may be thought unnecessary. It may however, be interesting to know that gypsum is found in the earth, in four different states: 1, in the pulverulent and friable form, which constitutes gypsious earth, fossil flour, &c.; 2, in solid masses, which constitute plaster stone; 3, in stalactites, and 4, in determinate crystals of different forms." The author † who has given this account of gypsum, observes, "that one hundred parts of gypsum contain thirty of sulphuric acid, thirty-two of pure earth, and thirty-eight of water. It is subject to a great number of varieties of color, which are the signs of various qualities, relative to its uses. That which is grey is less valuable than the white. The several states of the oxides of iron, with which it abounds in greater or less quantities, constitutes its rose colored, red and black varieties." In all tight, hard and dry soils, which are not too near the ocean, it has generally been found to be a valuable manure, and it has a tendency to equalize the respective value of the soils, by enabling the farmer to render those which are light and sterile, almost as productive as those which are naturally rich. From one to two bushels has been found sufficient for an acre, varying the quantity according to the condition of the soil. It has been generally found most valuable when applied to red clover, as it greatly increases that crop, and fits the soil to produce others. For corn, planted on land of rather a light and dry soil, it is very efficacious: about a common spoonful, of that which is good, is sufficient for a hill. It has been found more or less, a stimulant to every kind of plant, except wheat and rye; on those it seems to have no very sensible effect, but will often cover the ground with a fine sward of white clover, which is an indication that it has enriched the soil and fitted it for a better succeeding crop; for it is well known that a rich sward will always afford a good crop of wheat or rye. If then, the farmer would reap immediate benefit from this manure, by putting it on his fallow ground, or that which he intends for winter grain, he should apply it early in the spring, and by the first of June the field may be covered with a fine growth of white clover; then if the ground be broken up, and the sward effectually cov-

* See Henry's Chemistry. † Mr. Chaptal.

ered, it has been found to yield a good crop of wheat or rye, nearly double the amount which might be expected from the field without the gypsum.

But when the farmer by good husbandry, has once put his farm in a condition to produce good crops, it would be better economy to turn his attention to the business of saving the manure, that might be furnished from the various substances annually produced, especially, when he has to transport the gypsum any considerable distance, it being a heavy and expensive article to move. The expence of manure, as well as every other part of husbandry, should be apportioned to the profits which are to be expected as the probable result.

Of the dung of domestic animals, most used, horse dung is believed to be the worst, and that of sheep and swine the best. If the former be suffered to lie long in a heap, it will be greatly injured, and may be entirely spoiled by its own heat, which is to be known by its white mouldy appearance; and therefore, if it is lying in a large heap, should be applied as soon as possible, for spring crops. It is most suitable for cold, wet and stiff soils; as is that also, of sheep dung, though this is good for any soil. Every kind of barn manure is much injured by being exposed to rains, and therefore, should be kept as much under cover as is practicable. The opinion that some farmers have entertained, that a wet or moist yard for cattle is profitable, because in it, vegetable substances become rotten, or decomposed more rapidly and effectually, is very erroneous, and should be exploded.

It is observed by Mr. Davy, in his agricultural chemistry, that there has been no question on which more difference of opinion has existed, than that of the state in which manure ought to be ploughed into the land; whether recent, or when it has gone through the process of fermentation; and this, he observed, was a subject of discussion, so late as 1812. Yet, he is of opinion, that the knowledge of the simplest principles of chemistry, may remove all doubt on this subject. For, says he, as soon as dung begins to decompose, it throws off its volatile parts, which are the most valuable and most efficient. Dung, which has fermented, so as to become a soft, cohesive mass, has generally lost from one third to one half, of its most useful constituent elements. It evidently, says he, should be applied as soon as fermentation begins, that it may exert its full action upon the plant, and lose none of its nutritive powers. He further remarks, that besides the dissipation of gaseous matter, when fermentation is pushed to the extreme, there is another disadvantage in the loss of heat, which if excited in the soil, is

useful in promoting the germination of the seed, and in assisting the plant in the first stage of its growth, when it is most feeble, and most liable to disease; and the fermentation of manure in the soil, must be particularly favorable to the wheat crop, in preserving a genial temperature beneath the surface late in autumn, and during winter." Again, says he, it is a general principle in chemistry, that in all cases of decomposition, substances combine much more readily at the moment of their disengagement, than after they have been perfectly formed. And in fermentation beneath the soil, the fluid matter produced is applied instantly, even while it is warm, to the organs of the plant, and consequently, is more likely to be efficient, than in manure that has gone through the process; and of which, all the principles have entered into new combinations."

It would seem from the above remarks of Mr. Davy, which are probably founded on correct principles, that vegetable substances, proper for compost manure, would prove most efficacious, by being buried with the seed, before they had become decomposed by fermentation. But as such substances, during the time necessary to collect them, are exposed, many of them, to the alternations of drought and moisture, before the proper period of seed time, the expediency of collecting them together in some suitable and convenient place of deposit, where they may become partially decomposed, without being injured by excessive fermentation, is very obvious. These, and other considerations, have induced many farmers, both in England and America, to appropriate for this object, a small piece of ground with boards or stone, as circumstances will best admit, from two to four rods in length, and five or six feet high; the extent to be apportioned to the probable quantity of substances, intended to be thereby secured; one end of which is left open, or so that it may be opened, to take out the compost, when ready for use. This to be made the receptacle in which to deposit every ingredient which in a state of decomposition, may be useful as manure. In the spring of the year, whatever remains in the barn-yard, of any kind of straw, or spoiled hay, or any substances not in a proper or convenient state to be applied as a manure, to be deposited in this receptacle, which should generally be located adjoining the barn-yard. This to be considered the place of deposit for all the scrapings of the wood-yard, cleanings of the cellar, leached ashes, and generally, for every kind of dirt or substance capable of making manure.* When this by practice,

* Among the refuse matters which furnish continual resources for compost manure, may be enumerated the flesh of shambles

has become an essential measure, it will be found that much litter, not only about the barn, but house, will be converted to a useful purpose; and, even if no other object was thereby promoted, it would greatly contribute to that neatness, conducive to health and comfort. The receptacle where composts are deposited, should be covered, so that no more water can pervade it than is necessary to aid in the process of its decomposition. For if it be permitted to be kept so moist, as to keep up a considerable degree of fermentation long before it is applied, it will thereby throw off a great portion of its most nutritive elements. To render it, therefore, most efficacious, it should become only so far decomposed and rotten, that it may be manageable with a shovel and dungfork, for carting and covering in the soil. Dry vegetable substances, of any description, which may be proper for manure, when they are permitted to lie scattered, and exposed to continual alternations of drought and moisture, as they usually are over the large team yards of many of our farmers, through the summer, lose by that means, as well as by excessive fermentation, a great part of their fertilizing ingredients. So, also, if they are permitted to lie in a wet yard, where they will be leached with water, the farmer may be assured, he will thereby lose a great share of the benefits, which he might otherwise derive from them.

It is easy to discover, from what has been observed above, that dry, and other vegetable substances, may be made manageable as manure, and deposited in the soil, so that the process of fermentation may be made to progress with the germination of the plant that it is intended to nourish. The practical farmer may be apt to think it will require too much

and other animal substances, of fish, of soap-boilers, of tallow-chandlers, of shoe-maker's shops, of dye-houses, of printing works, of rags, of hair, of horns, of scrapings of oiled leather, of sweepings of cotton and woollen mills, work-shops, ware-houses, rubbish of old buildings, &c. &c. Spent tanner's bark, mixed with lime, it is said, will make a valuable manure.

NIGHT SOIL. Decency and health require every practicable means to be used, to render innoxious, or speedily to remove all accumulations of this kind from our dwellings. Yet this manure, which is esteemed by far the most efficacious of all others, is commonly lost. If fine sifted coal ashes, or more especially fresh slacked lime, were frequently thrown down the privies, all disagreeable and unwholesome smells would be prevented, and the quantity and value of the compost greatly increased. By this management, its removal would be also rendered convenient and inoffensive to those employed.

attention to use those means which may be necessary, to make such an exact preparation of his manure, that it may become decomposed to such a certain degree as to be easily managed with the shovel or dung-fork, and yet be able to commit it to the soil before its value is too much diminished by fermentation. When, however, the ingredients are collected in the manner which has been mentioned, a very little experience, with the exercise of his discretion, will enable him so to manage it, that it may become decomposed sufficiently for the purposes of manure, without heating it so that it would produce too great a degree of fermentation. If the depository is sufficiently large, it may be spread, when deposited, so as not to expose it to any great degree of heat, and it should be exposed to no more moisture than to decompose it so that it may be cut and managed with the shovel. The English farmers, when they provide a depository, construct the roof, or cover to it, so that only a little rain will drop through; and some of them even provide certain places on the roof, where, by removing a board or shingle, they can let in water at their discretion. The sheds which are usually attached to barns, may be so situated that the horse-dung may be thrown under them, and then some part of it occasionally spread over the whole mass of composts. This will prevent too great a degree of heat in the horse-dung, and at the same time help to improve or prepare the composts.*

It is easy to conceive that the farmer who cultivates no more land than enough to furnish him, with his industry, a comfortable support for his family, or the one who cultivates any less quantity of land, and needs all the income from it that it can be made to produce, may lose a great portion of his

* From the science, derived both from philosophical principles and practical observations, respecting the application of compost manure, it is very obvious, the diversity of opinion respecting its application arises from errors in practice. Those who destroy the efficacy of their compost manure, by exposing it to excessive moisture, or too great heat by fermentation, may well suppose it had better be carried fresh to the field, and buried with the seed; while those who carry it fresh to the field, and do not leave it thoroughly deposited with the seed, unexposed to the sun and wind and rain, may believe it would be more efficacious, to first decompose it so that it may thereby be rendered more practicable to bury it, or mix it with the soil. Whatever mode the farmer may be disposed to adopt, he should recollect that the excessive heat necessary to reduce it to a fertilizing state, should commence and progress with the germination and growth of the plant.

time and labor in tilling it, by not making a careful and judicious application of compost manure, which may be entirely within his power. When he is apprised of this, and has adopted the principle, that it is necessary and proper to collect and save every thing that is suitable to make this kind of manure, he will find the quantity immediately increasing beyond what he had conceived, without the experiment; and which, by applying it while it still retains its most nutritious elements, will so increase the efficacy of his labor, as richly to reward him for his particular attention to this branch of agricultural science.

There is hardly a day passes, in which a child may not be taught to contribute something, by its industry, to the quantity of compost.

There are certain chemical tests by which the progress of fermentation may be ascertained. But the farmer will be more likely to regard some general principle, which may aid him in the exercise of his discretion, to decide correctly in this matter. If he finds the degree of heat, either in the common dung-hill or heap of compost, is not so great as to destroy itself, and terminate in a degree of temperature equal to that of common earth at the same distance from the surface, it may be continued without injury. Any moderate degree of heat which may be continued until the manure is committed to the soil, may be kept up without materially impairing the efficacy of the manure. His own observation may therefore aid him to a correct exercise of his discretion. Too much attention to the object of providing compost manure, cannot be given by the farmer who would increase the productive powers of the soil to their greatest extent.

What has been remarked above, respecting the importance of properly securing and preparing compost manure, is not considered inconsistent with the practice of applying vegetable substances, such as straw, dry corn-stalks, &c. as manure, whenever they are ready at seed time, in sufficient quantities; but the farmer will see from what has been observed, that such substances must be effectually buried with seed, if he would render them most efficacious. But it is well known that this is seldom if ever effected by the usual process of ploughing and harrowing, as it is practiced by most farmers. The coarse undecomposed substances spread on the field, are not all buried with the plough, many of those that are, are drawn out again by the drag teeth, and left exposed to the alternations of drought and rain, to evaporate and waste, without efficacy to the soil. Some few farmers in our country, are so well aware of the importance of effectually covering coarse vegetable sub-

stances when applied as manure, especially such as straw, or the remaining stalks of Indian corn, that they cause it to be deposited in the furrow by one who follows the plough, in such manner that it is entirely covered by the succeeding furrow, and then construct the harrow by placing an additional frame on the top, so that the teeth are prevented from running so deep as to disturb the manure; and it is believed that a strict regard to economy would justify such a measure, unless other means equally operative can effect the object. The proper application, as well as the providing a supply of nutritious aliment for the plant, are equally essential in a good system of husbandry.

The great mass of our practical farmers are not learned in chemical science, and generally attend more to the most practicable and convenient modes of applying manure, than to what may prove to be the most efficacious results of their particular modes of applying it. Although many of them are easily made to believe that compost manure cannot be expected to afford food for plants, until it is covered in the earth, and goes into a state of entire decomposition, and the nutritive qualities dissolved, or converted into a liquid state; yet, notwithstanding, they are in the practice of carrying it into the field in its undecomposed state, and after the process of ploughing and harrowing is finished, to leave a large portion of it uncovered, and the rest of it not located in a manner from which they can have reason to expect any immediate benefit. After the process of seeding is finished, the strawy, or other coarse fibrous substances, are often to be seen scattered on the surface, which are either pulled out of the ground with the harrow, or which have never been covered with the plough. While persisting in this erroneous practice, derived from tradition, they seem to indulge in the hope that if they once spread upon the land, straw half rotted, or other similar ingredients of manure, it will somehow get mixed with the soil, and become efficacious for some future crop, if not for the present season.

There is much diversity of opinion respecting the location of manure, whether it should be above or below the seed. It is very certain that it must be placed near the space which the root will probably occupy. What that distance should be to render it most efficacious to different plants, must be determined by observation and experience. Tap rooted plants, like the carrot, parsnip, beet, &c. which extend downward as they progress to maturity, require the ground to be mellowed, and the manure buried deeper, than roots which are bulbous, as the potato, onion, turnip, &c. or than wheat, barley, oats, &c.

which have fibrous roots, which extend horizontally in every direction.

The efficacy of ploughing in green crops, has been particularly noticed in the essay on wheat culture, &c. But as it is a most important means of fertilizing the soil, from the fermentation gradually converting the vegetable substances into the food of plants, it should be here remarked, that in those cases where they do not prove efficacious, it must necessarily be from some circumstances of bad management or inattention, which counteract the obvious tendency of the substances to that conversion, which is necessary to enable them to act. Every vegetable particle under the surface, dissolves and yields gasses, which may be either taken up by the roots of plants, or carried away by the atmosphere; but crops may be so imperfectly buried as to convey those gasses into the air, instead of retaining them in the soil. If this operation be not strictly attended to, failures may be expected. The best way of proceeding is to roll down the crops with a barley roller, and to add a skim coulter to the plough, going in the same direction as the roller, to plough six inches deep, and to have no other successive tillage than shallow on the surface. The effect of the operation, like many others, will depend on the execution.

IMPROVEMENT OF LAND BY BREAKING UP OLD GRASS WITH THE PLOUGH.

The following remarks from the agricultural Encyclopedia, appear to have been the result of observations, founded on the experience of the best English farmers.

The author of these essays has thought proper to abridge them, and occasionally adopt his own language, so as to render it more intelligible, and more applicable to the condition of the American farmers.

By old grass is meant that which has remained a great number of years without being turned up by the plough. Although few branches of husbandry afford room for more successful cultivation than the breaking up of old grass, yet it generally happens that those so engaged seldom gain much profit to themselves, or convey any benefit to the land under their man-

agement ; and it is probable that to the imperfect mode of culture often practised when the plough was introduced into old grass land, may be attributed this failure, and the strong antipathy which influences the majority of proprietors against renovating them by tillage. It is, indeed, well known, that many fields of such land have been considerably injured, in consequence of the plough being used, which was entirely owing to the omission of the most proper mode of destroying the aboriginal inhabitants.

Ploughing the land at proper intervals, will never reduce the natural value of any land, provided the management in the interim is well executed.

Land, which has laid a considerable time in grass, is in every situation brought with difficulty into a proper arable state ; because the roots of the natural grasses retain such a hold of the soil, that artificial plants cannot either thrive or prove productive, till the former are completely eradicated, or destroyed. This difficulty prevails in different degrees, according to the nature of the soil cultivated ; for upon soils of a light, or mellow nature, grass roots may be destroyed with greater facility, and corn crops gained, for a series of years, at much less expense than is practicable upon soils that are composed of clay, and which are situated on a bottom which is retentive of moisture. But though corn crops may, in the first instance, be easier cultivated, upon some soils than upon others, yet no soil whatever can be successfully restored to grass in a suitable manner, without being completely summer fallowed, or sufficiently cleaned by a fallow crop, according to its nature and other circumstances. It is from neglecting these radical operations, that the conversion of grass land to tillage so often proves injurious to the occupiers.

No kind of soil requires to be oftener renovated by the plough than clay, especially if it be of a thin nature. The best grass is always obtained in the first year after being sown down, while the roots are creeping upon the surface, and not obstructed by the poverty or sterility of the subsoil. Rich clays will progressively improve while kept in grass, though in an inferior degree to those soils of a drier and less obstinate nature. Hence the great propriety of exercising alternate husbandry upon clayey soils ; in other words, of breaking them frequently up with the plough, and restoring them again to grass, after being cropped for five or six years. When grass land of a clayey soil is converted to tillage, it has been said the first crop in every case ought to be oats ; the reason assigned, is, that there is no other grain that forages so well, and

consequently makes a greater return of produce at the outset, when the surface is obstinate, and the natural grasses subdued.

To procure a full crop, both good ploughing and plentiful harrowing are necessary. The plough should go deep, and lay the furrow well over.

It should be harrowed length ways, till the surface is in some measure broken, when cross harrowing may be resorted to. Old grass lands have sometimes required eight or nine double lines of harrows, before it would be considered as in any thing like a finished state. The most advantageous practice is, to summer fallow all such lands in the second year; and this practice is decisively recommended as being most conducive to the interest of the occupier. Repeated trials confirm the fact that heavy land cannot be brought into a good cultivable state without this radical measure is resorted to.

The grub-worm is often a dangerous foe to corn crops, on clayey soils newly broken up from grass, especially in the second and third year, and indeed during every subsequent year, till the land is fallowed; and no other effectual method of extirpating this mischievous insect is so well known as that of repeatedly ploughing the ground in the summer months, or pairing and burning the surface. Another circumstance, which renders an early fallow highly necessary, is, the quantity of thistles and other rubbish usually infesting grass land, which, if allowed to remain undestroyed, will effectually prevent artificial crops from thriving.*

A dressing with lime will also be highly beneficial, as all old grass land, when first ploughed, is much improved by calcareous matter. If the ploughing is effectually done, so as to place the grass and other vegetable substances accumulated in former years, in a proper state for their entire decomposition, it will be sufficient, without dung, for carrying on the growth of

* This measure is not in conformity to the principle of a rotation of crops, as recommended in other essays contained in this work. Why is it not better to plough such lands in the preceding autumn, and expose them to the winter frosts? And a crop of corn and potatoes, or even beans and peas, would more effectually clear such lands of weeds, than a summer fallow, as it is usually executed. The method of breaking up old grass land much oftener than has been practiced heretofore, in this country, is, undoubtedly, one of the most valuable modern improvements in agriculture; but so is that of substituting a summer crop for a summer fallow.

plants for a considerable time. This, however, will depend on the natural strength of the soil.

Many of the American farmers, who believe the raising of stock more profitable than grain, often err in supposing that more stock can be supported by letting their old grass land remain for pasture, than by converting it to tillage; and to introduce the system of alternate husbandry, no doubt more capital is required, besides a good deal of trouble in its execution, but these are indispensable requisites in every improved system.

As the result of great experience, the English farmers have found, that alternate husbandry is most beneficial to cultivators, and to the public; that a farm managed according to its rules, will yield a greater quantity of produce, than if any other system is adopted; that if one half of the farm is kept under artificial grasses, and other green crops, as much live stock may be supported and fattened upon the produce, as if the whole farm was kept in old pasture: and that the other half, from the large quantity of dung produced from the consumption of green crops, will furnish as much disposable produce for supplying the market, as if the whole farm had been kept in a regular sequence of corn crops.

When a soil contains a great quantity of small loose stones, and the surface been made smooth for mowing, and it has been long appropriated to the use of meadow, the breaking it up with the plough is a more troublesome and expensive operation; but even under such circumstances, it is believed great advantages would generally be derived by breaking up such meadows, and if the soil is sufficiently dry, or can be made so by any tolerable expense of draining, to convert them to tillage by a rotation of grain crops,* giving it occasional supplies of manure when it can be had, until the roots are entirely decomposed, so as to become a constituent of the soil.

By this means the soil becomes fertilized, by exposure to the salutary influence of the solar rays, and by reducing to compost manure the whole mass of vegetable substances formed by the roots of grass and weeds.

It is well known that many of our farmers, especially those

* Grain, in its most extensive sense, may be descriptive of seeds of any fruit, though by common acceptation, it is understood to describe such as are used for bread. But when we consider it as a necessary article in the rotation of crops, it may be extended to signify not only Indian corn and the culmiferous crops, such as bear seed in a chaffy head, as wheat, rye, barley, &c. but also leguminous crops, as peas and beans.

who cultivate but a few acres, say from ten to fifty, content themselves to partake the small pittance of grass which is the produce of a feeble growth, from roots which have been undisturbed, without culture and almost destitute of nourishment, for a great number of years. Some justify this practice from the uncertainty of getting it so well stocked again with grass, as well as from their incapacity to defray the expense of introducing the necessary operations of the successful tillage of such land. And this latter objection may, under certain circumstances, be insuperable. But certain it is that those who have both disposition and capacity to overcome every objection to the breaking up of their old grass, and have judiciously and thoroughly introduced grain crops in a proper course of alternate husbandry, have generally been amply compensated for all their extra expense and trouble, which this mode of culture requires.

I am aware that the argument in favor of often converting old grass to tillage, does not apply here with the same force that it does in Great Britain; as laborers are more scarce here, the price of labor higher, and much less is requisite to manage our grass crops. But that we may duly appreciate the system of alternate husbandry here, we should consider that by a judicious management of it, the same quantity of labor may not only greatly increase the quantity of grain, while it will also provide us with at least as much grass, and thereby instead of diminishing, might greatly increase the quantity of animal food.

IMPROVEMENT OF LANDS BY PLOUGHING AND HARROWING.

There has been much diversity of opinion among farmers in America, heretofore, relative to the depth of the furrow most likely to improve the soil, and thereby enhance the crop. But this diversity must always have been owing to the want of correct knowledge respecting the nature and properties of the different soils.

It is very certain that the depth of the furrow in ploughing should depend on the nature of the soil and of the sub-soil. It is said by a celebrated chemist, that in rich clayey soils, the furrow can scarcely be too deep; and in sands, unless the sub-

soil contains some principle noxious to vegetables, the same practice should be adopted.

When the roots are deep they are less liable to be injured by rain or drought; that as the layers shoot forth their radicles into every part of the soil, the space from which the nourishment is derived is more considerable than when the seed is superficially inserted in the soil. But in a fertile shallow soil, situated upon cold clay or sandy sub-soil, deep ploughing may be very prejudicial.

It is of consequence to attend to the season proper for ploughing clayey soils. If it be too dry it will not crumble, as it should do to prepare it for a crop; and if too wet, the ploughing will only render it more compact. The hard clods are easily mellowed with a plough after they have been merely wet through with a gentle rain.

The ploughing of land in the best manner for the culture of particular plants, is of great importance in the improvement of the soil.

Some remarks have been made in the Essay on the culture of wheat, relative to the practice of summer fallowing in preparing the soil for that crop; by which it appears that the fallow ploughing would, if performed in the month of November in the preceding year, or just before the commencement of winter frosts, not only be better for crops of wheat, but better contribute to the durable improvement of the soil.

It has been found by various experiments that summer fallowing at the usual season in June, is never useful, unless it is repeated so often as to prevent the growth of grass and weeds, and too keep up a fermentation in the soil. That although a very rich soil may require a little more than to be sufficiently mellowed for the reception of the seed; but that all others which are naturally more or less sterile, or have been exhausted by too frequent cropping, may be greatly recruited by frequent ploughing and harrowing.

A Mr. Quell, a practical and intelligent farmer of Great Britain, from a course of experiments and observations, formed an opinion that lands can be made and kept rich by the mere use of the plough and the harrow. Various experiments have been made to ascertain the degrees of efficacy to be derived from repeated ploughing, and the result has been found, that the crop has been increased, other circumstances being equal, in proportion to the number of times the ploughing has been so repeated. More especially is frequent ploughing necessary in the clayey and stiff or hard soils; as it will not only better

prepare the ground for a single crop, but will thereby greatly improve the soil.

When your sward land is intended for spring crops, it should always when circumstances will admit, be broken up early in the fall preceding, and if it is a very moist soil, should be thrown up into ridges by repeated ploughing, that it may be fertilized by being exposed to the winter frosts.

In fact it is well ascertained by experiment that the sediment or settlings of dew water are greater in quantity, blacker and richer, than those of rain water; hence the utility of ploughing when the dew is on is obvious, as it tends to fertilize the soil.

The farmer cannot, it will be said, always wait to have his lands ploughed while the dew is on, and neither can he always appropriate as much of his labor to repeated ploughings, as the benefit of his crops may require; but when he comes to duly appreciate this measure, he will find himself well compensated for so arranging his business as to devote much more of his time to this subject, than has usually been practiced by the American husbandman.

The repeated and thorough ploughings, as well as many other practices necessary to enhance the productive powers of the soil, if properly attended to, will leave to the practical agriculturalist but a very little leisure. The more science he obtains relating to his occupation, if he would properly improve it, the less time he will find to devote to idleness or dissipation.

Since writing the above the following instances of the utility of frequent ploughing has come to my knowledge, which is worthy of notice. A farmer in Connecticut owned a certain piece of very light sandy soil, such as generally constitutes the plain land which produces a natural growth of pine timber. About two acres of this soil which had been cleared, lay a great number of years in a barren state without producing any useful vegetable. He ploughed it eight times successively during the summer months; some part of the ploughing he performed in the morning when the dew was on. At the usual season he sowed it with winter wheat, without applying any kind of manure; and the next summer it produced a very valuable crop. The barrenness of this kind of soil and its usual properties are well understood by farmers throughout the United States. It is impossible therefore to account for the increase of its fertility, on any other principle whatever, but that of the repeated ploughings.

It is believed that ploughing any soil just previous to the

commencement of the winter frosts, next previous to the season when it is to be seeded for a crop, has a great tendency to fertilize the soil.

The following experiment is a confirmation of this fact. A farmer in New-Jersey some years since, trench ploughed an exhausted field of stiff soil in the fall; cross ploughed a part of it, and in that part broke the lumps to pieces. In the spring the field was all ploughed equally and sown with barley and clover. The part on which the most labor had been bestowed was in fine order when sown, and yielded about thirty bushels an acre of barley; the other part was still in lumps, the frost not having been found sufficient to mellow them entirely, and the product of barley was only about twenty bushels an acre. The same difference was afterwards observed in the clover.

But this field with this stratum of crude earth thrown uppermost, it is evident would have yielded little or nothing the next spring, and until mellowed and fertilized by summer suns, had it not been mellowed and fertilized by winter frosts.*

To improve land by ploughing, or to plough it so as effectually to answer the necessary purposes of tillage,—it is essential that the plough should be constructed and so managed when in operation, as to cut all the land at the bottom of the furrow clean, and not only so but to turn it flat over, especially if there is any vegetable living on the surface, to be destroyed. By only loosening the soil, without cutting the bottom of the furrow clean, the purposes of ploughing are in part defeated.

It is a fundamental principle in tillage that the soil must be pulverized, and the seed so distributed, that the food necessary to its growth may be made to contribute equally to the nourishment of every grain sown or planted. If this is true, the more perfectly this operation is performed by ploughing, the greater crop may be expected. If parts of the soil which the roots of the plant would penetrate, are left in a hard state unloosened by the plough at the bottom of the furrow, the growth of the plant will be thereby retarded and its produce lessened. Or if the stiff clods of earth are left unbroken after the process of harrowing is finished, the space which they occupy is thereby rendered less productive; the seed it is true may force its plant to emerge from under the clod, but the stock of the plant in that case is forced to occupy the space which, if the seed is equally distributed, as it should be, is barely sufficient for the growth of the plants which would otherwise be its sole occupants; the consequence is, that the plants around the clod, by being too

* See Farmer's Assistant, page 68.

much crowded and retarded in their growth, are rendered thereby less productive; while the space occupied by the hard unbroken clods is rendered less conducive to the success of the crop. The savings made by a proper use of the plough and the harrow, and the roller too, when necessary, are no inconsiderable items in the aggregate profits of the farmer; if there is a little negligence and unskilful management in every part of the tillage process, it cannot be expected that the soil will yield an adequate compensation for the labors thus bestowed. It was probably the importance of a perfect pulverization of the soil, that might have led to the invention of the roller, which is often necessary to effect that operation, especially in very clayey or stiff soils. But on ordinary loose soils, the proper use of the plough and the harrow may effect the object. By a proper knowledge of the food of vegetables, and the manner in which it is communicated to the plant, the farmer will derive additional evidence of the necessity of the entire separation of the particles which compose the soil, by the tillage process; whence it will appear that no proper nourishment of the plant which may be contained in unbroken clumps or clods of the soil, can contribute to its growth until they become pulverized.*

The want of sufficient animal strength to plough the ground of a suitable depth for the effectual pulverization of the soil, may be considered an insuperable objection to many well informed farmers. To remove this objection and introduce an improvement in the economy of teams generally, a celebrated agriculturalist,† suggested the following practice, the efficacy of which he has attested by actual experiment. To first plough the ground only half the depth required; that the resistance of the soil may by that means be overcome by the application of one half of the animal strength; and by repeating the operation the same depth of ploughing will be attained by only one half of the animal exertion, which would be required, to plough the same depth with double the exertion at one operation, the resistance of the loose soil occasioned by the first furrow, being too small to be taken into the computation.

It may be worthy of consideration, whether even those who have the command of sufficient strength of team for any purposes of tillage, may not pulverize some soils more effectually and more economically, by taking two or more furrows instead

* See essay on food of vegetables and the manner in which it is communicated to the plant.

† Major General Alexander Beatson, honorary member of the English board of Agriculture.

of one, to loosen the soil to a proper depth for good cultivation.

The celebrated Quell was of opinion, that land can never be made too fine by tillage; and that the finer it is made the richer it will become. He observed that the fine parts of the earth are impregnated with some of the riches carried in by the dews: but the larger rough parts cannot have that benefit; the dews not penetrating to their centres, they remain poorer.

There can be no doubt but that a perfect pulverization of the soil places it in a better condition to let in the atmospheric air amongst the minute particles, and for permitting the rain and dew to spread equally, and for giving to the roots the faculty of entering into all the cavities.

ROTATION OF CROPS AS A SUBSTITUTE FOR SUMMER FALLOW.

In treating of fallows, there appears to be some difficulty in comprehending the real views of different writers, probably on account of the different import with which the term fallow has been understood in different countries, and at different periods of agricultural history; even the expositors of the American language are not very explicit in their definitions of the term. It is believed, however, that the farmers of New-England have generally applied the term fallow to the ploughing of land which has lain at rest in grass, or which has rested after a previous crop the preceding year without being stocked with grass-seed or ploughed. And when it is ploughed early, or in any of the summer months, for the purpose of ploughing it again, and thereby preparing it for an autumnal seeding with wheat or other winter crop, it is termed fallowing, or fallow ploughing. With these views, which the farmers of our country have had of fallowing of land, and of fallow land, it will be easy to understand what is intended by substituting the rotation of crops, for the summer fallow, as an improvement in the system of agriculture.

"The substance of the arguments generally used against fallow, may be comprised under four heads:

1st. Nature does not require any pause, or rest; and the earth was evidently designed to yield a regular uninterrupted produce.

2dly. As the productive quality of the earth never ceases, if corn is not sown, weeds will be produced: therefore it is our business to expel the unproductive plant, and to introduce others that are beneficial.

3dly. That the idea of leaving land to rest, is ridiculous; for by keeping it clean, and by a judicious intermixture of crops, it may be managed like a garden, and sown from one generation to another.

4thly. That the fallows in England exhibit nothing but a conflict between the farmer and his weeds, in which the latter generally prevail; for at best they are but half stifled, and never effectually killed."

Notwithstanding these arguments, which ought to have great consideration in deciding with respect to the expediency of abolishing summer fallowing, as pertinent to a general system of good husbandry, some writers contend for the practice of summer fallows, while the reasons they assign for it obviously show that they have derived their information from farmers who have not understood the efficacy of a rotation of crops, as a substitute or preparatory measure for summer fallows. Their reasons are, that a fallow in the summer months is the only effectual method to thoroughly clean the land of weeds; but the object of leguminous* crops, raised on the lands, which would be otherwise fallowed, is intended not only to extirpate the weeds more effectually, but to enrich the lands, and better prepare them for a winter crop. If any of the leguminous crops are to precede the sowing of winter grain, and they are kept clean, as every such crop should be to render it successful, it is very evident that the prevalence of weeds will not only be thereby better prevented, but if the same nourishment is applied to the leguminous crop which was intended for the succeeding crop, the soil will be thereby more fertilized.

It should however be understood, that this practice of substituting a rotation of crops for summer fallow, cannot be recommended only in those parts of the country, where the continuance of the warm season will admit of bringing to maturity and clearing off the preparatory crop in season for the reception of the winter grain seed. But where the climate will admit of a tillage† crop annually, it appears to be the prevailing opinion

* Under the head of leguminous crops, the British farmers rank beans, peas, tares, potatoes, turnips, ruta-baga, cabbages, and carrots, which they call enriching crops. See Encyclopedia, under agriculture, p. 232.

† By tillage crops, should be understood, those which are cultivated with the plough and hoe, in distinction from those of grass.

among modern agriculturalists, both in Europe and the United States, that the productive capital of our country may be increased by increasing both the quality and fertility of lands suitable for annual tillage, by substituting a rotation of crops, for summer fallow, whenever circumstances will admit of it.

It is very evident that old grass, when broken up, cannot be sufficiently subdued, for a culmiferous crop, either of summer or winter grain, unless ploughed the autumn preceding seed time; and if broken up in autumn, it may be prepared for a summer crop, which if properly managed, will make to the cultivator a saving of one year's rent.*

When lands are stocked with clover, or any other artificial grass, which is in such a state of vegetation that it may be supposed to fertilize the soil, so that the crop of grass it may produce, together with the increased fertility of the soil, will more than compensate for the advantages to be derived from a summer tillage crop, it may be best to let it remain, till the crop of grass is off, and then after turning it over with the plough, sow on the furrows winter grain, after first drawing a bush, or very light harrow, so as not to uncover the sward, and then cover the seed in the same manner. But still it is believed that on such lands, if the farmer can dispense with the crop of hay, the soil may be better prepared for winter grain by some leguminous crop. A tillage summer crop will more effectually pulverize the soil, than can be effected by the usual summer fallow.

SOILING, ITS ORIGIN AND ADVANTAGES.

The feeding of cattle,† in stalls or other suitable places, during the growing season, with grass cut and carried to them, is a practice denominated soiling of cattle; and prevails extensively in Great Britain and some parts of the United States.

This practice, like many others, which have led to important

* See Essay on Wheat.

† In agricultural science, the general name of cattle is given to all tame animals which are fed in pastures, and the term neat cattle, is used to distinguish the low kind from others.

discoveries and improvements in the science of agriculture, must have probably originated from the necessities of those who occupied but small tracts of land, and who needed the produce of more stock than could be sustained from common pasture, as it is generally improved. This practice cannot therefore be recommended to that class of farmers, which perhaps are the most numerous in this country, who possess considerable tracts of land, which can hardly be rendered suitable for any other purpose but pasturage; or to that class, who, without the greatest regard to the neat profits, would rather indulge a disposition to consult their ease in their modes of cultivation: but to that class whose farms are small, and who are stimulated by the laudable ambition of improving a little land highly cultivated, rather than a great farm badly managed; and to that class also whose whole farms are capable of being either tilled or mown; particularly, when their condition is such that they cannot easily procure manures.

The advantages to be derived from soiling, have been recommended by some very celebrated authors, and other eminent farmers of Great Britain.

Dr. Thaer, physician to the Electoral court of Hanover, in a communication to the English Board of Agriculture, lays down the following as facts which are incontrovertible, as the result of the experience of the Baron de Bunsen and others: "That a spot of ground, which, when pastured, will yield only sufficient food for one head, will abundantly maintain four when kept in the stable.

"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 spread on the meadow, and exhausted by the air and sun, its power is entirely wasted.

"Cows which are accustomed to soiling, will yield much more milk when kept in this manner: and fattening cattle will increase much faster in weight.

"They are less subject to accidents and diseases; they are protected from the flies, which torment them in the fields during warm weather; and they do not suffer from the heats of summer."

As it respects the quantity of land saved by soiling, it must, in some measure, depend on the nature of the soil, and the condition of the land appropriated for that purpose. All the writers on this subject, as well as many other practical farmers, appear to be well agreed in this one point, that a given

quantity of land may be made to sustain many more cattle, and to keep them better, by soiling than by pasturing them. The great question is, whether the economy on land and saving of manure is a sufficient compensation for the extra labor.

There can be no doubt but that the practice of soiling would be very profitable to those who would derive the greatest profit from a small tract of land; and many who practise it upon a large scale, think it good husbandry.*

ADVANTAGES OF THE ROLLER.

This implement has long been used in Great Britain, and considered very necessary in an improved state of husbandry. It cannot however be used successfully, except on lands which are clear of stumps and stones on the surface. But on such ground it is useful to smooth the surface of meadows, which are uneven. They are useful also in breaking the lumps of baked earth in a clayey soil, and for passing over ground newly sown with grain, or that are to be laid down to grass, as it will render the surface forever after while in meadow, more smooth, so as to enable the farmer to cut more of the grass, and with less labor.

Its use, on dry grounds, which are sowed with different kinds of grain, is to cause the mould to inclose the seed, many of which by lying in cavities, that soon become dried, might otherwise fail of vegetating; while it prevents the moisture generally from evaporating so easily as it otherwise would. It is also useful in depriving certain insects of their hiding places in the cavities of the soil.

The rolling of land in tillage, should be done when the ground is so dry that it will not stick to the roller; and it should be performed on grass lands in the spring when the ground is soft and wet.

A wooden roller should be about six feet in length, and about twenty inches in diameter, round and of a uniform surface. It is sometimes made with stone, and then it should be about four-

* See further remarks on this subject, under essay on artificial grasses.

teen inches in diameter, and about the same length as the above mentioned wooden one. The summer fallow is greatly improved in strong soils, because without its aid the large and obdurate clods cannot be reduced; and it appears that for accomplishing the different purposes for which rollers may be necessary, those of various sizes and dimensions may be required. It is said that wooden rollers drawn by one horse answer very well for grass and turnip land; but massy stone rollers drawn by two or three horses, are necessary on clayey soils. "The expedition which takes place when rollers are used, compared with the tedious and expensive progress of breaking clods with malls, formerly the general custom,* sufficiently proves the importance of these implements, though it deserves to be remarked, that when rolling is bestowed upon a spring sown field, harrowing it afterwards, is of great advantage. By harrowing it after the clods are reduced, the earth stands the effects of rain better afterwards, and does not consolidate so firmly as when that process is neglected.

"The spiky roller is much recommended by some English writers for mellowing some clayey ground that is baked in clods. It is also recommended to be passed over fields of wheat in the spring, for the purpose of loosening the ground, and then to be followed by a brush harrowing." But quere; this must depend on the peculiar condition of the soil and grain at the time. "Its further use is to tear and loosen old grass bound meadows, for the purpose of making the grass grow more thriftily again." But had not such old grass bound meadows ought to be ploughed up?†

The spiky roller is merely a wooden roller with iron teeth, or spikes drove into it. They are to be about seven inches long, and drove three inches into the wood, and set four inches apart, in diagonal rows round the roller, the outer ends are not to be sharp, but square.

* This has an allusion to the custom in Great Britain; the farmers in the United States have generally used in tillage no other process to break the clods, but with the harrow. It is only in places where agriculture is progressing in a state of great improvement, that it is believed to be necessary that the soil should be perfectly and uniformly pulverized, either before or after the seed is committed to it.

† See essay on improving land by breaking up old grass with the plough.

CULTURE OF WHEAT.

THE great varieties of wheat which have heretofore been known by different names and properties, appear at present to be classed by the British Agriculturalists under two principal divisions, though each of these admits of several subdivisions. The first is composed of all the varieties of red wheat. The second division comprehends the whole varieties of white wheat; which again may be arranged under two distinct heads, namely, thick chaffed and thin chaffed. But as the thick chaffed wheat has by the British farmers been supposed to be constitutionally predisposed to the disease called mildew, it is generally gone out of use. The thin chaffed wheat is said to be a hardy class, and seldom mildewed, unless the weather be particularly inimical during the stages of blossoming, filling and ripening, though some of them are rather better qualified to resist that disorder than others. There is no important division of the classes of wheat generally in use in the United States, but that of winter and spring or summer wheat. The varieties which may be said to grow out of these two divisions, respectively, are distinguished rather by their different qualities, than by any distinct properties peculiar to their kind. And the different qualities are owing sometimes to diseases, as mildew, blight and rust, occasioned by the inevitable effects of unpropitious seasons; though perhaps oftener from bad culture, such as sowing poor seed, on unsuitable soil, want of manure and proper tillage. Bad seasons may unavoidably injure the quality of wheat, bad culture will inevitably do it.

In every part of the United States where the climate and situation will admit of this crop, it has been found that winter wheat will grow in almost every dry soil that is sufficiently rich. Very sandy and very gravelly soils are however thought to be the most unsuitable. Dry red loams with a trifle of clay in them are thought to be the best. It is said that the soil, the analysis of which is mentioned in the essay on the nature and constituent properties of soil, which consisted 56 parts sand, 26 clay, 12 of vegetable substances, such as compost manure, and six of soluble salts, would produce great wheat, as almost every other crop. It has been found by experience that the time for sowing depends much on previous habit. Thus, if it were sown a number of successive years by the middle of August, and then the time of sowing were changed at once to October, the crop would be lighter on that account. But where wheat has become habituated to be sown late, it does well. The latter it is sown the more seed is requisite. A bushel to the acre

might answer when sown early, when the same seed, on the same soil might be sown so late as to require a bushel and a half or more. But the quantity of seed wheat like most other seeds, should also, in some measure, be apportioned to the quality of the soil, as it may be supposed to produce more stalks in a rich than in a more barren soil, by affording more of that nourishment necessary to their germination and growth. The quantity necessary must therefore be left to the discretion of the farmer, who in the exercise of it should take into consideration the condition of the soil, the quality of the seed, and the time it is sowed, whether early or later.

It is certain that a good crop cannot be expected unless the seed is of a good quality, free from the grains of diseased wheat, and from the seeds of weeds. The English farmers say that the seed should never be taken of wheat which has grown on sandy land, nor from any other but from that which has grown on soils most natural to it. The changing of seed should also always be attended to when circumstances will admit. It has been remarked that in the culture of Indian corn, its seed will be more productive if brought from different places and mixed. The same effect might be produced on the crop of wheat, by preparing the seed in the same way.

It is said to be the best antidote against wheat winter killing, to sow it so early that the roots will attain more extent and strength.

"It is not the immediate effect of frost upon the wheat plant that does the injury. But a clayey soil, having absorbed a large proportion of water, becomes cellular as the water freezes, or rises up in various protuberances, so that the roots of the wheat plant become disengaged from their hold in the soil. It is very manifest that if wheat be sowed so early that each plant may have time to extend its roots into the soil, its chance for retaining its hold will be better."*

Spring wheat should be sown as early as the ground can be made mellow. It grows best on new rich land, or lands which have been well manured and borne Indian corn or potatoes the preceding year. It is found to degenerate very quickly; and for this reason new supplies from a more northerly climate are necessary.

The summer wheat which is brought from Canada is found to produce much larger crops in the northern states of America, than that which has been sown here for some time. But wheat that is carried to a climate much more northerly than

* Eaton's Agricultural Calendar.

that in which it has long been sown, will not answer well, as it will be too long in ripening.

When a soil natural to the production of wheat becomes too much exhausted, the farmer who can apply a suitable quantity of vegetable manure, will be thereby enabled to insure a good crop. But as the economy of saving and preparing manure composed of vegetable substances, decayed or decomposed, has not yet been much attended to in this country, other means may be successfully resorted to. One of these is what is called green dressing. This is done by turning under with the plough a growth of green vegetables, for the purpose of manuring the soil.

In Great Britain, and in some parts of our country, buckwheat is much used for this purpose. When this is to be done, the land which is intended for a crop of wheat, should be ploughed up in the month of May, instead of the time usually practiced, after the first hoeing of corn; and about half a bushel of buckwheat to the acre, sown and lightly covered with a bush, so as not to uncover any of the vegetable substances that may be turned under with the plough; and when in blossom, run a roller over it exactly in the way it is to be ploughed under. By that means, it may be more effectually covered with the plough. After it has been turned under about twenty days or a month, it will be rotten, and in a proper state to be ploughed again to receive the grain intended to be sown. If the buckwheat, before it is sown, is wet, and as much gypsum as will adhere to the grain, strewed over it, the growth of it will be much larger, and of course the quantity of manure thereby increased.

Another vegetable, proper for the green dressing culture, is red clover. This too should be turned under with the plough when in full blossom; if the farmer cannot dispense with the crop of clover for feeding his stock, still he will find by ploughing under what remains of the clover, will furnish him with a considerable supply of manure for his crop of wheat.

If the soil is dry and sandy, gypsum should be sown on the clover, and in a good season, a good crop of wheat may, by this culture, be produced.

In most of the older settlements in the northern and middle States, a considerable portion of the lands which are summer fallowed, are lands which have been considerably reduced by too frequent cropping, and some benefit is expected from the manure which may be derived from the small quantity of grass and other vegetable substances which are turned under with the plough; and for the rest of the food necessary for the success of

the crop, they rely on scattering over the field what little manure they have saved from their barn-yard, and that often by greatly lessening their spring crop which needs its nourishment. This practice, as a general system of husbandry, has been too much over rated. Mr. Davey, in his agricultural chemistry, observes, that when weeds are buried in the soil, by their gradual decomposition, they furnish a certain quantity of soluble matter ; but it may be doubted whether there is as much useful manure in the land at the end of a clean fallow, as at the time the vegetables clothing the surface were first ploughed in. Carbonic acid gas is formed during the whole time by the action of the vegetable matter upon the oxygen of the air, and the greater part of it is lost to the soil in which it was formed, and dissipated in the atmosphere. The action of the sun upon the surface of the soil tends to disengage the gaseous and the volatile fluid matters that it contains. And heat increases the rapidity of fermentation ; and by the summer fallow nourishment is rapidly produced at a time when no vegetables are present capable of absorbing it.

He farther observes, that land, when it is not employed in preparing food for animals, should be applied to the purposes of preparing manure for plants ; and this is effected by means of green crops in consequence of the absorption of carbonaceous matter in the carbonic acid of the atmosphere. In a summer fallow, a period is always lost in which vegetables may be raised either as food for animals, or as nourishment for the next crop ; and the texture of the soil is not so much improved by its exposure as in winter, when the expansive powers of ice, the gradual dissolution of snows, and the alternations from wet to dry, tend to pulverize it and to mix its different parts together.

By the method of green dressing, above described, two great advantages are obviously derived. One is the acquisition of a supply of manure which will be sufficient to insure a good crop ; and which in some conditions the farmer could procure from no other source :—The other is that by ploughing it in the spring, as in the case of buckwheat, before grass and other noxious weeds gain strength, their prolific tendency is greatly retarded if not entirely destroyed. And it cannot be kept too much in mind, that all weeds by being suffered to grow, exhaust the soil. Any given quantity of grass or weeds, growing with a crop of wheat, or any other which is cultivated, lessens its product in proportion to the weight of the green weeds with that of the growing crop.

But to remedy the evil resulting from summer fallowing,

and also prepare the soil for a crop of wheat with less barn or vegetable manure, the best method, and that which is most practised at the present time, both in Europe and some parts of the United States, is by a change of crops. That is, by sowing wheat after certain other crops, which from their nature are calculated to prepare the soil for the culture of wheat. There is no doubt but that the land which is fallowed for a wheat crop in the month of June, in the usual way, might, by being ploughed early in the spring, and sowed with peas, or planted with potatoes or beans, be made by such culture not only to produce to the farmer a clear saving of either of those crops for that year, but also prepare the soil so as to render the success of the crop of wheat thereon the next year much more certain.—The advantages of this mode of culture for wheat result from two considerations—first it has been found by chemical analysis of these plants, that the bean, the pea, and the potato, contain a large portion of the same soluble and nutritive substances that are contained in wheat. The vines of those plants, therefore, when ploughed under the surface of the soil, furnish a useful manure for wheat; and by the culture of these plants, the weeds of every description are more effectually destroyed, than by the summer fallow. It may therefore, be correctly calculated, that the barn or other vegetable manure which is usually applied to the soil after a fallow for wheat, will, if first applied to those preparatory crops, become much more useful to the crop of wheat.

The changes of crops which are best calculated to affect the success of the wheat crop, as well as many others, will depend on the soil and other circumstances which may attend the condition of the farmer. In a fertile sand, sandy loam, gravelly loam, or other dry warm soil, it has been found profitable by some practical farmers to adopt the following rotation of crops; to begin the first year with corn and potatoes, first ploughing in all the barn dung made that spring; the second year corn, which will then receive the greatest benefit from the rotten dung, and the previously fermented state of the soil; the third year barley, and clover sown with it; the fourth clover; the fifth clover, one crop, and then the sward after the clover has grown considerably again, well turned over, and harrowed in with wheat; the sixth, wheat sown as before mentioned with clover; the seventh and eighth with clover; and then the sward torn up again in the fall for potatoes the next year.

It will be seen that in this rotation, if the soil is well fertilized and prepared the first year for the corn and potatoes, it may be kept in good condition for any of the succeeding crops of

wheat, by the fertilizing effects of the other crops, without any other additional manure, and that too, with the saving of a valuable crop in every year. There will also be materials furnished for making an annual provision for manure from the clover hay, corn stalks, potato vines, and the straw and stubble of the barley and wheat, which being properly saved and applied will not only preserve the soil in its original fertility when the rotation commenced, but would greatly increase it.

The rotation which has been above described may suggest to the mind of the intelligent farmer, others, by which the same object may be effected. In raising this crop the hopes of the farmer are often liable to be blasted by the ravages of an insect called the Hessian Fly.

A remedy for this evil may be found in the following account of a respectable farmer of Pennsylvania:—"This destructive insect is propagated from the eggs of the fly, deposited on the grains of wheat when ripening; the truth of which I learned from actual observation. The fly may be seen by the middle of June, and from that time till wheat is cut, flying about and lighting upon ears of wheat. It deposits its eggs upon the outer end of the grain, where they may be seen with a good microscope or optic glass; sometimes to the number of six or seven on one grain. They remain there till the grain is sown. It bursts its shell and enters the shoot where it lies in a torpid state till the next spring, except in some instances, when wheat is sown early, the fly commences its ravages in the fall. When this is discovered, the best method is to turn sheep upon it, and pasture it short, either in the fall or in the winter.

The most effectual way to check the propagation, is in preparing the seed before sown, which should be in the following manner:—Put you seed into a nogshead, tub, or vat, and even it with water; let it stand ten or twelve hours; then put off the water, put the wheat upon the barn floor and sprinkle lime over, and with a shovel mix it till it is well covered with lime. Let it remain in that state 24 hours, and the eggs will be destroyed without any injury to the seed. The following observations lead to this discovery. In viewing several grains of wheat in a microscope something resembling the eggs of insects was observed upon them. Twenty grains were selected with those appearances; they were put upon some raw cotton and a little earth, in a tumbler of water, and observed every day; and on the day the grain opened and put forth its tender fibre, the insect burst from its shell and was not to be seen. Ten days after, five of the grains with their roots and blades were taken from the glass and carefully examined. In three

of them the insects were found. The other seventeen remained, and overspread the top of the glass. They were preserved till spring, when on examining them, every stalk had an insect in it, some two, and one had four. Twenty other grains were selected, and the lime applied for twelve hours. It was then washed, and the color of the eggs were changed, and being put into a glass, in like manner as the others, the wheat grew, but the eggs did not produce. The roots were transplanted and grew well. And ten bushels of wheat limed as above, produced a good crop, while the neighboring fields suffered materially, and some were almost wholly destroyed by the fly."

Smut is often a great injury to a crop of wheat. For a remedy the following experiment developes much useful information on this subject:—Mr. Young sowed fourteen beds with the same wheat seed as black with smut, he says, as he ever saw any. The first bed was sown with this wheat without washing, and this had 377 smutty ears. That washed in clean water had 325; that in lime water 43; that in lye of wood ashes 31; that in arsenic 28; again, that steeped in lime water four hours had 12; that in lye four hours had 12; that in arsenic four hours had 1. And again, that which was steeped in lye as before mentioned 12 hours had none, and that which was steeped in the same kind of lye 24 hours had none; that also which was steeped 24 hours in lime water had none; that steeped in arsenic 24 hours, had five. It appears from this experiment that steeping the seed 24 hours in lye will effectually prevent smut. Let the lye be made pretty strong, and if the seed wheat is steeped longer it will not injure it unless it be kept too warm. Lime water and salt lime applied in this manner, will, no doubt, answer the same purpose. If steeping in arsenic a longer time should prove effectual, this would also be an excellent antidote to birds; or to prevent them from picking up the seeds, the lime water and arsenic might be used together. It has been observed that seed wheat which has been well ripened before harvesting is much less liable to must than that which has been cut early. Let the wheat for seed be the last harvested, and let it be kept by itself perfectly dry until it is thrashed. Some have practiced thrashing it out in the field when in a very dry state. The reason assigned for this is that smut is believed to be somewhat infectious; and therefore if wheat, entirely free of this disorder, be put in a mow with smutty wheat, the whole mass will become more or less infected with smut, by reason of sweating or heating of the mow.

Wheat that is very smutty in the field, should not be har-

vested until the crop is so fully ripe and dry that it will shell out considerably in harvesting and thrashing. Thrashing in the field would no doubt, in this case, be preferable. As the dryer the crop is when thrashed, the more readily would the smut be broken.

Mildew is thought to be occasioned by cool nights, when the atmosphere has become cooler than the earth, which in that case forces the juices upward too fast, and thus bursts open the stalks; to which there is no remedy known: but its effects, it is said, may be in a great measure counteracted, by cutting the wheat as soon as it is discovered to be struck with mildew; this may be done three weeks before the usual time of harvesting.

The grain in that case will be smaller than usual, but, it is said will make much better flour, and the quantity will be greater, as the skin will be found very thin. If the grain has attained its full size, though only in the milk, it is sufficient; as it will receive that nourishment from the stalk which serves to mature it. Mr. Young says, that when the wheat stem has a particular cast, of a bluish green, it is then affected with mildew. The green stalks of the wheat must be sufficiently dried before stacking, and when carted in, they will be clear of the mildew, and will make good fodder.

It is believed by some farmers, that nothing is gained by letting wheat stand until it is fully ripe, that is, till the heads turn down, before it is harvested. One reason given is, that if it stands so long, considerable will be shelled out before it is got into the barn; and even if the bulk should in this case be greater, still it is not certain the weight will be increased; and as wheat is sold by weight, not by the bushel, and as it is known that the best flour is made from the earliest harvested wheat, the farmer, from these considerations, may probably be the gainer by commencing his harvest some earlier than the usual time. By this means too, he will be less in danger of having his wheat grown by long continued rains; for wheat harvested early, is less liable to grow than that which is cut late. But in ascertaining the proper state, it is necessary to discriminate betwixt the ripeness of the grain and the ripeness of the straw; for in some seasons the straw dies upwards; under such circumstances, a field, which to the eye appears to be completely fit for the sickle, may have its grain but imperfectly consolidated, and perhaps not much removed from a milky state, though it is obvious that under such circumstances, no further benefit can be conveyed from the root, and that nourishment is withheld the moment that the roots die; yet it does not fol-

low that grain in that condition should be immediately cut, because after that operation is performed, it is in a great measure necessarily deprived of every benefit from the sun and air, both of which have greater influence in bringing it to maturity, so long as it remains on foot, than when cut down, whether laid on the ground or bound up in sheaves. The state of the weather at the time also deserves notice; for, in moist, or even variable weather, every kind of grain, when cut prematurely, is more exposed to damage than when completely ripened.

DISEASES OF WHEAT. Since the last essay on the culture of wheat has been prepared for the press, the following interesting remarks on the diseases of wheat, which have been heretofore published in the agricultural Encyclopedia, it is believed, may be of much importance to the farmer in managing this most valuable crop.

"It has, without inquiry, been taken for granted by some people, that blight, mildew, and rust, are the same disorder, though most agriculturalists have hitherto reckoned them separate diseases, brought on at different periods, and occasioned by different causes. It may be laid down as a primary principle, that the proximate cause of every disease which attacks the stock and ear of wheat plants, may be found in the state of the weather at the time, conjoined with the circumstances of soil, situation, and the seed that has been used. It is difficult to classify these diseases, or describe them in a distinct manner; because the sentiments, or rather the language of agriculturalists on this subject, is arbitrary and indistinct. Notwithstanding that they are by the great body of the farmers, attributed to atmospherical influence solely, yet much confusion arises in their nomenclature; for many people use the terms blight, mildew, and rust, as synonymous, though to us they appear to be distinct diseases.

"Blight according to our ideas, originates from moist or foggy weather, and from hoar frost, the effects of which when expelled by a hot sun, are first discernible on the straw, and afterwards on the ear, in a greater or less degree, according to the local circumstances. Let the field be examined in a day or two after such weather, and a careful observer will soon be satisfied that the fibres and leaves of the plants are contracted, and enfeebled in consequence of what may be called a stoppage of perspiration. This disorder may take place either earlier or later, but is most fatal when it appears at the time it is forming in the ear. It may appear at an earlier stage; and though

the productive power of the plant will thereby be lessened, yet if circumstances are afterwards favorable, the quality of the grain produced may not be much impaired; or it may appear after the grain is fully formed, and then very little damage will be sustained, except by the straw.

"Mildew, again, strictly speaking, may be ranked as a disease which affects the ear, and is brought on by causes similar to those which occasion blight, though at a more advanced period of the season. If this disorder comes on immediately after the first appearance of the ear, the straw will also be affected; but if the grain is nearly or fully formed, then injury on the straw is not much discernible. We have seen a crop which carried wheat that was mildewed when the straw was perfectly fresh, though this rarely happens. A severe mildew, however, effectually prevents both corn and straw from making any further progress; the whole plant apparently going backward every day, till existence in a manner ceases altogether. Something akin to mildew is the gum or red ochre, which in warm moist seasons, attaches itself to the ear, and often occasions considerable damage. All these different disorders are generally accompanied by insects; which animalculæ, by many people who take the effect for the cause, are considered though without the least foundation, as the authors of the mischief that follows. Their appearance, however, may justly be attributed to the diseased state of the plant; for, wherever putrefaction takes place, either in animal or vegetable substances, the presence of these insects will never be wanting. Another disorder which affects wheat, and by several people denominated the red rust, is brought on by excessive heats, which occasion the plants to suffer from a privation of nourishment, and become sickly and feeble. In this state, a kind of dust gathers on the stalk and leaves which increases with the disease, till the plant is in a great measure worn out and exhausted. The only remedy in this case is one that cannot be administered by the hand, a plentiful supply of moisture, by which if it is received, before consumption is too far advanced, the crop is benefited in a degree proportional to the extent of nourishment received, and the stage at which the disease has arrived.

"There is not the slightest reason to believe that parasitical animalculæ are the agents of these diseases, because the whole of them may be imputed to atmospherical influence, yet it is not easily ascertained whether excessive drought or excessive rains are most pernicious. Perhaps both may have an influence, as the plant being stunted and debilitated by drought in

the first instance, is afterwards unable to bear up and flourish when visited with heavy rains, especially if these set in when the crop is in a critical stage.

“Whether blight and mildew be considered separately, or viewed as one and the same disorder, appearing at different periods of the plant’s growth, we are convinced that both may with truth be reckoned to proceed from an unhealthy atmosphere, when the crop is in certain stages of its progress to maturity. Not only the extent but the very appearance of blight and mildew are entirely governed by the seasons, and that with respect to wheat, the kind sown, whether thin or thick chaffed, has a very considerable effect in lessening or increasing the effects of these baneful disorders; and that even soil, culture and situation, each have their respective influence. It seldom happens that either blight and mildew are felt in dry warm seasons, except in close confined fields, when the evening dews stagnate, and remain till they are removed by the meridian sun. On the other hand in every moist season, whether cold or warm, blight, mildew and gum, on the ear, are experienced in a greater or lesser degree. In such seasons thin chaffed wheats are much less injured than those that are thick chaffed, which circumstance is in direct opposition to the doctrine that blight mildew and rust, are brought on by parasitical plants or fungi.

“Soil, culture and situation have in an inferior degree an influence in the growth and progress of diseases. Some soils are naturally so moist at bottom, that dampness issues from them at all times. Superior culture and excessive manuring are apt to cause a crop to be early lodged, in which case one disease or other is sure to seize upon it; and a southern aspect and every confined situation are much more hazardous than those of a northern or western exposure, and where the air has free egress. In a word, when hoar frost or vapour of any kind is dispelled by wind, no danger will follow to the crop; but when a hot sun is the agent, we have repeatedly noticed the most serious losses.*

* See Encyclopedia on diseases of wheat, page, 277.

CULTURE OF RYE.

There is no difference between what is called winter and spring rye. Winter rye, by sowing it later and later each year in the fall, will acquire a habit and quality by which it may at length be sown in the spring, and then it is spring rye; or take spring rye and sow it very late in the fall, and then a little earlier each succeeding year, and it will become confirmed in the habit of winter rye.

One circumstance favourable to the cultivation of this kind of grain is, that it will grow year after year on the same soil without exhausting it, provided the stubble be constantly ploughed under immediately after taking off the crops. Another circumstance peculiar to this plant is, that it will grow very well, and produce the best grain for bread, on a thin gravelly soil, and will flourish well too on the richest.

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 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 sowed 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, a while during the next spring without injury to the crop. It may also be mowed down 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, for 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, when it 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 lie until about the first of September, then ploughed again, and the next crop harrowed in. Some have supposed that in this way the crops will increase in quantity.

Rye is subject to a distemper called the spur. The grains, which are affected with it, are larger than the rest, mostly crooked, bitter to the taste, projecting beyond their husks, dark coloured, rough, and deeply furrowed from end to end. This kind of diseased grain sometimes proves very destructive to those who eat it. In some parts of France, where the disease prevails most, the peasants who eat it are liable to be attacked with a dry gangrene in the extreme parts of the body, which causes those parts to fall off, almost without pain. "The Hotel Dieu at Orleans," says Duhamel, "has had many of these miserable objects who had not any thing more remaining than the bare trunk of the body, and yet lived in that condition for several days." It is not every year that the spur produces these effects, and it is said that if the grain be kept a certain time before it is eaten it will not be hurtful. It is thought however, that no very bad effects have been known in this country from eating this kind of rye.

When we consider that rye flour mixed with corn meal makes a wholesome and valuable bread, and can be raised on light soils, which under some circumstances may be devoted to that crop better than to any other, and when it is considered, too, that it is not an exhausting crop, the raising it cannot be considered an unimportant article of domestic economy.

Rye should never be sown on wet soils, nor even upon sandy soils, when the subsoil is retentive of moisture.

Upon all soft lands which have received manure, this grain thrives in perfection, and if once covered, it is believed, it will stand a drought afterwards that would consume any of the culmiferous tribe.

Where it is sown for pasture, as has been mentioned, it should, after having been fed, be suffered to grow up to a considerable green crop, before it is turned under with the plough, and with such culture it may be considered a certain means of improving the soil, not only for another crop of rye, but for any other crop, which is adapted to the nature of the soil.

CULTURE OF INDIAN CORN.

THIS plant is believed to be a native of America, and is well adapted to every part of the country, that has hitherto been explored. This grain presents at this time a great number of varieties, which are distinguished from each other by the color and size of the grain; by the number of rows on the cob; by the length of time they respectively take in ripening, and by the degree of hardness acquired by them. Some are white, and others black; some are yellow, and others are brown, or red, or violet. Some have cobs twelve inches long, studded with twelve rows of large grains; while others have only six rows, or a cob three inches long, and covered with grains even smaller than pepper corns. Some again are five months in ripening, while others are soft, and even succulent, and cannot long be preserved, but by means of artificial heat. The small, from its ripening soon, and the soft, from its greater tenderness, are most valuable in garden culture, and least valuable in commerce. It is thought no one of these varieties can be said much to excel all the others, because the difference in climate, soil, and culture, may, and probably has differently affected the growth and produce of the different varieties.

A change of seed with this grain, as with others, is expedient, and it is said that a change of seeds grown in different soils is better; and that changes ought to be from east to west, or from west to east, and not from north to south, or from south to north. Where the crop is raised on low grounds, which are subject to early frosts, the seed should be brought from the northward, that it may ripen before the frosts. It is believed that the longest ears and largest grains will yield the most.

It has been observed by a respectable farmer that he had found his crop of corn considerably increased by procuring his seed from different parts of the country, and mixing it.

With respect to the proper time for planting Indian corn, no invariable rule can be given; the farmer has to take into consideration the peculiarities of the season at the time of planting, as also the climate, and calculate as correctly as he can, so as to give the crop time to ripen before it is exposed to the frosts. From the 15th of May to the 1st of June, varying according to the variety of season and climate, are the most usual times throughout New-England.*

* For other remarks respecting the efficacy and application of manures proper for this plant, see essay on manures.

An opinion has heretofore prevailed, that corn is a very exhausting crop, much more so than potatoes. This is denied by some distinguished modern agriculturalists, especially by Doct. Elliot, called the father of New-England husbandry. In his *Essays on Field Husbandry*, published in 1747, he remarks, that "the larger the crop of corn, the better the succeeding crop; which is contrary to the fact from which the knowledge of an exhausting crop is usually derived.

Respecting the great value of this plant, it has been observed by an eminent agriculturalist,* that "if the theory which supposes that plants extract most or all their matter from the atmosphere, and that the whole of this matter is manure, be true, then that plant which produces most vegetable offal must be the most improving crop; and it will hardly be denied that Indian corn is entitled to this preeminence; compared with wheat, suppose the same land to produce as much grain of the one as the other, which in its use will make equal returns to the earth. Here the equality ends, if indeed it exists even in this point. The corn stalks exceed the wheat stalks in bulk, weight, and a capacity for making food for the earth. If any one who converts both his stalks and straw into manure, will compare their product in April, when he may distinguish one from the other, he will find in the former a vast superiority in quantity. The English farmers consider wheat straw as their most abundant resource for manure, and corn stalks are far more abundant: corn, therefore, is a less impoverishing, because more compensating crop to the earth, credited only for its stalks, than any in England. In comparing crops, to ascertain their relative product and operation on the earth, we must compare farinacious crops with each other; and consider the litter and offal they produce, not as wasted, but as judiciously applied to the compensation of the land. Corn produces a return, from the same land, of more offal or litter, in its stalks alone, than wheat does altogether. But to the stalks of corn, its blades, tops, husks, and cobs, remain to be added, each of which will nearly balance the litter bestowed on the land by the wheat."

The celebrated Arthur Young, in his travels through France, in 1789, makes the following remarks respecting Indian corn: Perhaps, says he, it is the most important plant that can be introduced into the agriculture of any country, whose climate will suit it. For the inhabitants of a country to live upon that plant which is the preparation for wheat, and at the same time

* Col. John Taylor, of Virginia.

keep their cattle fat upon the leaves of it, is a treasure for which they are indebted to their climate." Planted in squares or rows, so far asunder that all imaginable tillage may be given between them, and the ground thus cleared and prepared at the will of the farmer, is an invaluable circumstance; and finally it is succeeded by wheat. A country, whose soil and climate admit the course of, 1st, maize, (corn,) 2d, wheat, is under a cultivation that perhaps yields the most food for man and beast, that is possible to be drawn from the land."

The proper soils for this grain, are thought to be the sandy, sandy loam, gravelly loam, and rich red and dark colored earths, which have not much clay in them. Stiff clays are very unfit for this crop; and cold and wet loams are not much better, unless well managed.

There has been much diversity of opinion among farmers respecting the best manner of distributing the seed, so as to draw from the soil the greatest portion of food; and to equalize the apportionment of the soil, so as to produce the greatest crop.

A Mr. Stephens, near New-York, who raised on three acres at the rate of 118 bushels to the acre, planted his seed in double rows, about eight inches apart, and the seeds were set diagonally, the same distance from each other. Between these double rows, he left a space of five and half feet. A Mr. Ludlow, in the same vicinity, who produced at the rate of 98 bushels to the acre, on three acres, planted his seed in single rows, which were four feet apart, with the grains set eight inches asunder. A very extraordinary crop was raised in Massachusetts, by planting the rows two feet apart, in which the grain was planted in hills the same distance from each other, and two grains in each hill. This latter mode produced 112 bushels to the acre. In all these experiments an abundance of good manure was applied. As all these modes of distributing the seed were somewhat different from that heretofore most generally practiced throughout New-England, their successful result should remind the farmer, that it may often be expedient to examine the correctness of practices which may owe their origin to immemorial usage.

It should be remarked, that as this crop requires that the plants should be separated so that they can be kept clear of weeds by the plough and hoe, and hilled too, for the purpose of advancing its growth as well as to prevent its breaking down by the wind, the seed should be so distributed as to answer these purposes; and at the same time, the grains should be so far separated from each other, as to admit the salutary influences from the sun and atmospheric air. It will be noticed that

in the above experiments, except the last, the grains were placed eight inches from each other; and in the last, only two, instead of four or five, (the usual number) were placed in the same hill. Those who have planted in rows, and separated the grains, as in the two first mentioned experiments, have thought that about one sixth more can be raised on an acre, other circumstances being equal.

Those farmers who may adopt the mode of planting in rows, will find their account in using a light drill plough, that may be easily made for the purpose. One of this description may be drawn by hand, and so contrived as to make a small furrow about two inches deep, drop the seed at proper distances into the furrow, and cover the seeds, all in one operation. This method, however, is only practicable on ground entirely clear of stones. When every part of the soil is not sufficiently fertile to secure a crop, the method of placing the manure in the hill, or row, where the grain is deposited, is, doubtless, correct.

CULTURE OF OATS.

There is, perhaps, no crop, to the cultivation of which less attention is paid, than to that of oats; and perhaps the reason which would often be assigned for this negligence, is, that the crop, when raised, is of small comparative value with other crops of grain. But this is believed to be an error. For, where there is any tolerable mode of culture and preparing the ground, considering the usual market price, the crop ought to be good, to make it an object for the farmer to raise them: and it is a mistaken notion that they will do well with indifferent culture.

To raise a good crop of oats, the ground should be in good heart, and well prepared. Weeds, which are often permitted to grow among this grain, are very prejudicial.

The culture of oats should be encouraged, where the general use of horses, and the improvement of their breed, is an object, as it will always be in the United States. For, oats may be considered their best food, particularly when travelling, as they are of a loosening nature, while most other grains which are given to them, are binding.

In Great Britain, they have many varieties of this grain, among which are the oat in most common use here. "The Angus oat is there considered an improved variety of the other; the Poland oat, the Triesland oat, the red oat, the dun oat, the Tartar, or Siberian oat, and the potato oat. The Poland and potato varieties are best adapted to rich soils; the red oat for late climates; and the other varieties, for the generality of soils, of which the British isles are composed. The Tartar, or Siberian kind, though very hard and prolific, is much out of use, being of a coarse substance, and unproductive of meal; and the other kinds are, it appears, now principally superceded by the potato oats, which are considered by the most discerning agriculturists, as of superior value, in every respect, when the soil is rich and properly cultivated."

This variety has, it is said, in some respects degenerated, owing to the farina of other oats having communicated with it. It should be remarked that oats will always degenerate from this cause, as well as from bad culture, and when this happens, the farmer should renovate them by procuring pure seed from others, when it can be had, and if it cannot, it would be better to make a selection of the strongest ears, which contained the purest grain for seed, than to sow that which is light and impure.

From twelve to eighteen pecks of seed is generally allowed to the acre, according to the strength of the soil, and the variety that is cultivated.*

It is affirmed that land sown with potato oats, requires much less seed, in point of measure, than when any of the other sorts are used; because they tiller well, much better than Poland oats, and have not an awn, or tail, like the ordinary varieties. On that account a measure contains many more seeds of them than of any other kind.†

* A less quantity of seed is perhaps generally applied by our farmers; but it is believed that the crop is often lessened by too thin sowing. If the farmer understands the general principles which relate to the germination of seeds, he can safely exercise his discretion in assigning the quantity.

† This seed perhaps may have been improved from the oats in most common use in the United States; for there is no doubt but that this seed, as well as all others, may be greatly improved by selecting the largest grains, and which contain the most meal, and cultivating them so as to keep them clear from weeds and light impure seed. But if we would procure the best varieties of seeds, of domestic and foreign growth, by purchase, we may find

A moist soil is favorable to oats ; they should therefore be sown as early as the season will admit of, to avoid the injurious effects of the drought, which sometimes greatly injures this crop before it comes to maturity.

It has been found that gypsum will greatly increase this crop, if the soil be suitable for this kind of manure. It is the opinion of some respectable practical farmers, that the next crop to be sown after spring wheat and rye, should be oats ; and that it grows well on hills, or even mountains, where the soil is loam, underlayed by hard pan.

When the condition of a farm is such, that the farmer cannot procure a sufficient supply of hay for the support of his stock, without procuring it from his tillage ground, the expedient of raising a crop of oats for that purpose, has often been practised with success ; but when oats are sown for that purpose, a much larger quantity of seed should be sown, and the crop harvested after the oats have headed, and while the straw is green. This grain, as well as spring and winter rye, may be substituted for some of the artificial grasses, which are often raised for such purposes, on dry tillage lands.*

CULTURE OF FLAX.

The raising of flax requires so much labor, and at the same time is so impoverishing to the soil, that it can hardly be thought an object in the United States to make a business of growing more of it than may be necessary for domestic uses.

The same soil, it is thought by many good farmers, should not be sown with flax oftener than once in seven years.

It has been the practice of the New-England farmers generally, to prepare their ground for flax by previous hoed crops, which have been well manured. And this practice may be relied on for success, perhaps as well as any, especially when

them in most of our large cities, particularly in New-York and Albany, where they are kept by seed merchants, who make it their object to keep for sale the best kinds and varieties of seeds for culture.

* See essay on artificial grasses.

the hoeing has been thoroughly attended to, so as effectually to destroy the weeds, which are fatal to the growth of flax.

It has been remarked above, that flax is an exhausting crop. But as I have found a different opinion communicated to the Philadelphia Agricultural Society, I think it merits too much consideration not to be noticed, while on this subject.

The author observes, that he cultivated flax and potatoes in the same field; each crop having an equal quantity of manure; that in gathering an excellent crop of flax in July, the ground was immediately ploughed, and sowed with turnips; and produced one hundred bushels of good turnips per acre; on removing the crops of potatoes and turnips, about the middle of October, the ground was put into wheat; and that the wheat on the flax and turnip ground, was fully equal, if not superior, to the wheat on the potato ground. The same author observes, that the Irish, who for many years, have had great experience in the cultivation of this valuable plant, generally raised it on ground manured and planted with potatoes the preceding year. They sow on such ground three or four bushels of the best American seed to the acre. Hence a query may be suggested, whether the fineness of the Irish flax may not be owing to this thick sowing, rather than to their flax being pulled before it is fully ripe. It is said that the Flemings never pull the flax intended for their fine cambrics and linen, until the seed is ripe.

The quality of the flax may also depend very much on the future operations of rotting, breaking, and dressing.

In America, flax is for the most part rotted, by being laid thin on a grass field. The time required in this operation depends on the dryness or wetness, heat or cold, of the season. Flax is judged to be sufficiently grassed, when its bark is a little blistered towards the extremity of the plant, and when it parts easily from the seed, which at this time becomes very brittle.

The same author farther observes, that he had exposed flax in the months of August, September, and October, and that he had always found it rotted in August the best; and that some farmers of experience had observed, that the injury which the flax is thought to receive by the heat of the mid-summer sun, is by no means equal to the benefit it receives by being quickly matured. When flax is exposed in a variety of weather in a cold season, the putrefaction necessary to loosen and destroy the cohesion of the fibres of the flax from the seed, is so tedious as frequently to injure the fibres themselves.

The process of water rotting flax, is almost wholly practised in Ireland. One method of water rotting practised in some

parts of our country, is to bind it up in small sheaves, laid length ways across the stream, and sunk completely under ; about five days are generally requisite for this purpose. When sufficiently rotted in this way, a small handful may be pulled asunder with a little exertion ; and then should be taken out very carefully, so as not to injure the coat, and dried. The water in which it is rotted, should not run rapidly, as such will wash away the coat. If rotted in standing water, it should be turned once while it is rotting. It is essential that flax should have a proper degree of rotting. If rotted too much, its strength is impaired for present use, and it wastes more in cleaning ; and if rotted too little, a great addition of labor is requisite in fitting it for use. That which is coarse will rot quicker than that which is fine ; it would therefore be better, when practicable, that these should be kept separate while rotting, in order that the latter may have longer time for this purpose.

The short and the long should also be sorted, as it is inconvenient to have them mixed in dressing. It is of importance that the seed should be sown as evenly as possible, and to effect this, it is best to sow one half of the seed over the whole ground, and then the other half cross wise, and sown when there is no air in motion.

Salt is said to be one of the most valuable manures for flax. In one experiment by Richard Peters, Esq. of Philadelphia, it appears that, by sowing about twice the quantity of foul salt to that of flax seed, he had from three acres, fifty bushels of excellent seed, and a great crop of flax. From extensive experiments of this kind of manure, it is well ascertained that salt, as a manure for flax, should be applied, when it can be procured at any reasonable expense.

It is attested by some respectable farmers, that they have always succeeded in raising a crop of flax, by soaking the seed about half an hour in weak lye, or in strong lye diluted with six times as much water, and just as the seed is coming up, to sow on it two or three bushels of strong ashes per acre ; and that if it is taken wet from the lye and rolled in plaster, it is better.

No crop is thought to be better than potatoes to precede a crop of flax.

Notwithstanding the weight of authorities to the contrary, many farmers are of the opinion that flax is better if pulled a little before the seed is ripe ; they say the seed will ripen, in the swarth, if it is plump and full grown before the flax is pulled.

CULTURE OF HEMP.

Some farmers, well informed in the business of practical agriculture, are of the opinion that hemp may ultimately become one of the most important and valuable exports from the interior of New-England, as well as the western and southern States; and that it is as natural and valuable a staple, and every way adapted to our climate and soil, as cotton is to the climate and soil of the south. Some of them say that it will produce more pounds to the acre than cotton, and with much less manual labor; and will command in market, if properly prepared and handled, a price as great as the short stapled cottons, by the pound. And to induce our northern farmers to engage in it, it has been observed, that before the introduction of cotton into the interior of the Carolinas and of Georgia, corn and provisions were, as they now are among us, a mere drug, utterly unconvertable into cash, even at a very low price: and that as the introduction of cotton there raised the demand and the price, and made a ready market for grain, so that of raising hemp may in New-England and the western States.

Could the introduction of hemp become the means of diverting, in some measure, the market of rye and corn from the distilleries, those engines of corruption, disease and misery, it certainly would be a valuable improvement to the condition of our country.

We now purchase great quantities of Russian hemp at enormous prices, for the calls of our commerce and naval establishments, because we have not, it is said, sufficient that is fit for use.

Our surplus rye and corn now go to the retailing merchant, a great proportion of it, and from the merchant to the distiller. But if hemp were introduced as one of the staples of our agricultural system, the growers of it would be in a condition to purchase much of the grain which is now sold for foreign merchandize, and to pay cash for it, which would better promote the interest of those who cultivate it.

As the culture of this plant has not been much attended to in the northern States, the following remarks, by a writer who appears to have been a practical farmer, are worthy of consideration: "This plant flourishes most in a mellow, dry soil,* and the richer the better. It affords little or no profit on lands of

* The editors of the Agricultural Encyclopedia, however, say that the soils most suited to the culture of this plant, are those of the deep, black, putrid, vegetable kind, that are low, and rather

ordinary fertility. In soils naturally adapted to its culture, or in those sufficiently manured, it is one of the surest and most profitable crops, as the plant is subject to no disease, nor is it liable to be annoyed by any insect. Droughts do not sensibly affect its growth, and it is in no danger of being destroyed by cattle.

From two to three bushels of seed are requisite to the acre, proportioned to the fertility of the soil, as in other crops.

The seed must be of the year next preceding, as it quickly loses its germinative powers.

A ton of hemp when dressed, may be raised from two acres of land, of the highest fertility.

It is believed that in this crop, as in almost every other, material benefit is to be derived from soaking the seed, in a solution, not too strong, of common salt, or salt petre, or in a moderate lye of wood ashes, and then rolling the seed in gypsum, before sowing. The application of gypsum, as manure, after the seed is sown, is also beneficial, if the soil is suitable.

The ground should be harrowed before the seed is sown, as by that means the seed may be sown of a more even depth, that it may all start together; otherwise a part of the plants will outgrow and keep down the rest.

It should be sown as early in the spring as the ground can be put in proper order, and sufficiently dry. In ordinary seasons in New-England, it will be ripe for harvest about the first of August, the time for harvesting being indicated by the falling of the flowers, and the withering of the leaves.

The male plants of hemp bear the flowers, and the female plants the seed. A sufficiency of the latter are to be left for seed, and those will require about six weeks further time to ripen, the ripeness being known by the seed turning brown.

The seeds may be gently beat off the stalks when dried, or they may be taken off by a coarse comb, made for the purpose.

It is said the female hemp which has stood to ripen the seeds, requires a longer time to rot, than the male, and when dressed is harsher. It has been advised to sow some hemp thinly by itself for seed, and then the rest of the crop may be all pulled or cut together. In grounds that are smooth the crop is cut close to the earth, by a kind of scythe, made for the purpose. The usual practice, however, is to pull it in the manner of pulling flax.

inclined to moisture, as well as those of the deep, mellow, loamy or sandy descriptions; and that the quantity of produce is generally much greater on the former than on the latter, but it is said to be greatly inferior in quality.

When it is sufficiently dried, which in good weather will be in about one week, it is to be gathered in bundles, bound with in straw, and then carefully stacked up so as to be kept in a dry situation.

Many farmers practice rotting it in the winter, by spreading it on the snow, in the early part of winter, so that by being covered with other snows, it will be bleached and improved in its color. When the snows dissolve in March, it will be found sufficiently rotted.

When sufficiently dry, it should be first broken with a coarse break, and then with the common flax break; and dressed in the manner of flax, but more gently, as it will waste with hard beating.

The crop may also be rotted in the fall, in a manner similar to that of rotting flax; or, it may be water-rotted like that crop. When water-rotted, the hemp should be sunk completely under the water; and if it be stagnant, the hemp should be turned upside down, when about half rotted, otherwise, from the greater degree of heat on the surface of such waters than below, the upper part will be rotted before the under.

By water or winter rotting the coat of the hemp blackens much less than when rotted in the fall; and it is observed, that the warmer the weather, or the earlier in the fall the crop is rotted, the blacker the coat will be, as is the case also with regard to flax.

The crop of hemp should be harvested as soon as it is fit for the purpose; otherwise the male stalks will soon wither and blacken, after which the coat is of little value.

Hemp may be made a substitute for flax, for all common purposes. But in that case it is said it must be softened by steaming it over boiling water or lye, and beating it after it is dried again.

An excellent crop of wheat has been taken after a crop of hemp, and with very little expence.

The policy of introducing any new crop, to constitute a staple for market, should be adopted with caution. It has been remarked, that it might raise the price of grain, as did the introduction of cotton in the southern States; but is it certain that a ready market and high price for grain, are indicative of the most prosperous condition of a country? It is not certain that a majority of the citizens of any country would always be ready to give an affirmative answer to this question. The great question respecting the policy of raising our own hemp for commercial and naval purposes, rather than purchase it of foreigners, must depend on the effect it would have on the price of labor. A very large portion of our citizens, who constitute an impor-

tant part of the physical strength of our country, purchase their bread corn, for which they have to pay in their services only. The price of those services is not always enhanced in proportion to that of grain or butcher's meat. It should be a predominant object in the policy of our country, not to attempt the advancement of its general interests by means, which, in their operation, tend to depress the condition of the poorer class of citizens.

CULTURE OF TURNIPS.

THE culture of the turnip has, in England, been long considered a profitable part of field husbandry, though it has been in some degree superceded by that of carrots, which has been thought more profitable.

The raising of turnips is there considered not only an important object for the purposes of winter food for cattle, but also to improve and prepare the soil for other crops. It is said by the greatest authorities on English agriculture, that the introduction of turnips into the husbandry of Great Britain, occasioned one of those revolutions in the rural art, which are constantly occurring among husbandmen; and though the revolution came on with slow and gradual steps, yet it may now be viewed as completely established.

There are three kinds of turnips: the flat or round sort, which are in most common use in this country; also, the long and French turnip. Of the former, there are the green topped, the red purple, the yellow, and the early Dutch turnip. The last are sown early in the spring, for a supply of the market during the summer season. The green topped are considered the most profitable, and are raised for winter use. For raising them on a small scale, the following method has been found to succeed well: Turn over a turf of old sward the first week in June. Yard cattle on this, in the proportion of six head at least, to a quarter of an acre, until the 20th of July; then harrow lengthwise of the furrows, so as not to disturb or overturn them, and sow in the proportion of about half a pound of seed to the acre. If not convenient to yard cattle upon it sufficiently, about two inches of well rotted manure, harrowed in as above, will do for a substitute.

Some farmers who have made the culture of turnips an important branch of field husbandry in this country, give a decided preference to the drill husbandry in their cultivation. One farmer in the state of New-York, who has succeeded in raising vast quantities of this root, has practiced the following mode: After the manure is spread on the surface, to plough it in about the 12th of June, and then to harrow it smooth. After this is done to plough it into ridges, about 30 inches apart, and not wider than three feet; and then to sow on the ridges with a drill harrow; and as soon as the turnips are in the rough leaf, to separate them with hoes to about the distance of from four to eight inches, according to the species of the turnip, the larger sort requiring more room to spread; {killing at the same time all the weeds on the top of the ridges. When the turnips have become well fixed again, as many must be loosened in this operation, and the sides of those ridges covered with weeds, to introduce a small plough, and take a slice from both sides of every ridge close to the turnips; these slices of course fall into the furrow, carrying the weeds which grew on their sides. A day or two after, another plough, with a double mould board, is introduced into the furrow, and sweeps back the mould to its place. This operation may be repeated as often as weeds appear; but if it is effectually done once, it will not be wanted again.

This farmer, * in the year 1822, when he gave this account, raised of the Swedish turnip, or ruta бага, on one acre, one thousand and ninety-six bushels; and of the white globe turnip, on an acre, eleven hundred and forty-three bushels; † and he observes, that no crop can be more valuable than turnips. The thinning and weeding process, mentioned above, is considered an essential measure in the culture of turnips; and one would suppose the prejudices which may exist against it, on account of the extraordinary labor it requires, should be removed, from the consideration of the value of the crop which it produces. Another objection to making the culture of turnips an important object, may arise from the expence of harvesting and storing an article which requires so much room secure from frost. As the manner in which so great a crop is secured, seems to be connected with its utility, it may be interesting to state the manner in which this crop was harvested and secured, taken from the farmer's own account, who raised the crop.

*Mr. Featherstonaugh, of Duanesburg, State New-York.

† Upwards of two thousand bushels to the acre have been raised in Great Britain.

Six men were directed to take each a row, draw the turnips, strike off the long thin tap root and the soil with it, with a knife made out of old scythes, and throw them into one row, with their bottoms to the ground; and keeping their tops as free from dirt as possible. When a sufficient quantity were drawn for the day, the parties, six men, went back to their drawn rows, took up the turnips, and struck off the leafy tops into small convenient heaps, dropping the bulbs on the ground, which were taken up and carried in carts and sleds to cellars near the sheep folds, containing about 500 bushels each. When these were full, long square pits were prepared on dry knolls, in the fields, about a foot deep, and the turnips piled up in each, to the number perhaps, of three hundred bushels. Straw was put over them, and subsequently a foot deep of earth, making this covering somewhat thicker to the north-west; this he found by experience to be a sufficient covering, having taken them out in the month of May, perfectly sound. The tops were fed out constantly to horned cattle, as long as they lasted. The handsomest turnips with the smallest necks and tops, were selected for seed, without cutting the roots, and only a part of the tops, and then secured by themselves. These are planted out in dry mellow, and rich ground, on the first opening of the spring, a foot apart, and kept perfectly clean. The seed when ripe, is gathered early in the morning, while the dew is on the pods, and before they split open.

This crop, it is said, without exhausting the soil, prepares it as well as any other, for wheat or for grass. Where the soil is suitable for turnips, and the sheep husbandry is an object of much attention to the farmer, the raising them for feeding to sheep as well as cattle has been found greatly efficacious, and an important improvement in the system of agriculture. The following specific against the fly or little black flea, which are so destructive to the young turnip plant in warm dry weather, should be here noticed in addition to what, has been suggested on that subject, under the essay on insects.

Steep the seed in train or fish oil and sulphur, from 15 to 20 hours before seeding; the oil may then be strained off, and the seed rolled in plaster or ashes. The oil assists the vegetation of the seed, and impregnates the plant so strongly, that no fly will trouble it, till it is well leafed out.

Two, perhaps the greatest, difficulties to encounter in the cultivation of the turnip, are the fly and the worm. The former makes its attacks between the time of shooting out of the earth and the expansion of the seed leaf; the latter, from the time of becoming a bulb until it is at maturity. To counteract

the former, in addition to what has been said, it may be observed, that the first stage of vegetation should be forced, by sowing the seed immediately on the manure, and then top-dressing with lime, plaster, or ashes. The latter are repulsed in a great measure, by means of the hoe, by which the superfluous plants are thinned out, and the earth taken from those left for the crop, leaving the tap root only in the earth. By giving the full force of the manure immediately to the seed, the rough leaf is thrown out so rapidly, that the fly has little chance to operate; and by taking the earth from the bulbs, the worm cannot find means to attack it. It is said the best time to put in the seed is immediately after a shower, and that the seed should follow immediately the spreading of the manure, in the drills, so that it may not have a chance to evaporate or cool. From three pints to two quarts of seed has been thought to be a suitable quantity for an acre.

In cold climates, the securing of turnips from frost during the winter, where large quantities are raised, may be thought an objection to the cultivation of this plant. But those farmers who have made it an important object to feed neat cattle and sheep with them, through the winter months, think the providing proper cellars for the storing them, a necessary item in the expence of a good system of husbandry.*

If the farmer will compare the quantity of essential aliment contained in turnips, with that of good hay, which may be raised on an acre, he will be better enabled to form a correct opinion respecting their relative value, and respecting the expediency of bestowing the extraordinary expence, necessary to cultivate the former to advantage. Sixteen hundred bushels, which is not the most abundant crop known to have been raised on an acre, are estimated at about forty-seven tons. But let one third of that quantity, or about five hundred bushels, be considered an ordinary crop, equal to about fifteen tons; an ordinary crop of hay, say at about two tons, which is however, a large average estimate; and then compare the relative value and expence of the two crops.

It is not pretended that this root should be made a substitute for hay, or other dry food, but it seems to have been proved from the actual experiments of the best farmers in our country, a very important auxiliary in the raising and improving the breed of our neat cattle and sheep.

* See essays on neat cattle and sheep.

POTATO.

The culture of this root, although a native of America, has not been sufficiently improved, except in the vicinity of our large cities. To improve the quantity as well as the quality of the crop, particular attention should be paid to the seed. Potatoes planted several years from the same seed, will greatly degenerate, and produce little or nothing. One method to obtain new and various kinds of potatoes, is, to raise the seed from that which is contained in the apples. For this purpose, the apples should be gathered after the seeds are fully ripe, and mashed together in some water until the pulp is washed away and separated from the seeds. Then dry them, and the next spring sow them in a bed, and keep them clear from weeds until the young plants acquire their growth. The potatoes thus raised, of the first year's growth, it is said, will be small; they should then be sorted, and the next year planted, each kind by itself, and the products will be full grown, or nearly so. It will be found that some of the new sorts produced in this way, will excel in size and in the amount of the product; and others, also, will excel in dryness and superiority of taste. In this way the farmer can accommodate himself with such as are best for the table, and such as are more suitable for feeding swine, &c. A great diversity of opinion has prevailed respecting the size and condition of the potato best for seed; whether large or small; or whether large ones cut in pieces are not equally productive. But it is believed that no general and invariable rule can be adopted respecting this matter, from which circumstances may not render it expedient to vary. From some cause, which perhaps it would be useless to explain, were it even possible, crops equally good have been raised from seed in either condition. The large whole potato might however be considered preferable upon a dry soil, for the following reason: the outside skin of the potato, called the cuticle, is the most durable part, and seems to retain the moisture for the use of the plant, till it is all exhausted; and when potatoes are cut for planting, the nutritive juice is in a great measure absorbed by the earth. The opinion that the whole potato is not so good, on account of bringing the plants too near together, appears to be erroneous, when it is considered that in the progress of vegetation, the roots spread in every direction in quest of nourishment; and if that food which is necessary for the growth of the plant, is properly located contiguous to the soil of which the hill is composed, the plant will spread until it comes in contact with it, and absorbs it, and fills

the hill. But for a moist and weak soil, the seed potato may be cut, and thereby the crop increased from the same weight of seed; for on such a soil the moisture furnished from the whole potato is not wanted; and as the nutritive qualities in such a soil are more scattered, the roots of the plant will be more likely to come in contact with it, and derive nourishment from it, than if placed only in one particular point in the hill. For this reason too, it would seem to be more profitable to plant small potatoes in a moist soil than in a dry one.

The Irish, who perhaps raise and use more potatoes than any other people, it is said, generally cut their potatoes, and set them about ten inches apart. The practice, however, might have originated from the necessity of using a part of the potato for food. Circumstances may render that a sufficient reason here also.

Potatoes should be hoed when first up, just to clean out the weeds, with but little hilling, and when they are about seven inches high, should be hilled up for the last time. The hilling them up by a third hoeing may be rather injurious than otherwise. If weeds spring up so as to render a third hoeing necessary, they had better be pulled from the hill and cut up round it with the hoe, without enlarging the hill. It is an error to suppose, that it increases the crop of potatoes by enlarging the hill, in any instance where sufficient manure is deposited in or near the hill. By reference to the principles of vegetation, it will be found, that if the influence of light and atmospheric air are too far removed from the root by too deep burying, the less vigorous the plant and root. It is said that potatoes may be raised by covering them over with straw, when only laid on a clean sward, to the depth of about eight inches; and that in this condition they have been found to grow nearly as large as if buried in the ground, and to be drier and better flavored.

To get the greatest product of potatoes from a given quantity of ground, the most approved practice appears to be that of planting in rows, instead of hills. The following method has been extensively practised with success. After the ground is suitably prepared, to run very light furrows at the distance of about three, or three and a half feet apart: to drop the potatoes along the furrows at the distance of about eighteen inches apart, and to cover them with a light furrow run along on one side, or with the hoe; when the plants have grown to the height of six or eight inches, run the plough along on each side of the rows as close as possible without injuring the plants, turning the furrow from them, then immediately turn the furrow back to them, and thus the soil becomes sufficiently mellowed

to keep up a due degree of fermentation about the roots. This process to be repeated so long as the condition of the soil may require it, to keep the weeds down, till the tops become so large as to prevent them. This mode of culture in rows, it will be seen, will better admit the plough as a substitute for the hoe, and thereby save much time and labor.

When potatoes are planted in rows or in hills, before the potatoes are taken out of the ground, the tops should be first pulled and laid in heaps to be carried off for manure. If this is not done, they should be covered over with dirt, as the practice of some is; and the soil thereby becomes greatly fertilized, and prepared to receive the seed for winter grain. When this latter mode is practised, if the seed of another crop is immediately to follow, care should be taken that the tops should not be disturbed with the teeth of the harrow.

When the farmer has not sufficient manure to fertilize every part of the soil, it is a good practice to place it in the holes or rows, with the potatoes, the better to secure its efficacy for the present crop.

The editors of the Agricultural Encyclopedia, have observed that a new variety of potato may be propagated at any time by mixing different kinds in the same hill or furrow, and that if these are allowed to come to maturity, a kind of connection takes place betwixt the blossoms of each, which produces a new race, or variety. In this way, they say the numerous varieties of the potato root now prevailing in Britain, have been procreated and introduced.

This mode of acquiring new varieties is worth the attention of the American farmer, as we have not yet many of those varieties in general use, some of which may possess qualities of superior excellence and profit to any which are commonly cultivated.

In Great Britain, the leading and prevailing variety has been the yellow kidney, which, though it is not the most productive, it is thought to be the most delicious potato that is cultivated.

The black potato is the next favorite, though it should be remarked that this kind, being rarely taken up in a ripe state, is not fit for use till the spring months, when it acquires a closeness of texture and mellowness which it does not possess at an earlier period. The common red potato is probably a branch of this breed, as it appears to have the same qualities last described.

There has been found to have been sixty varieties of this vegetable, a particular description of which will not comport with the limits of this work. But it is hoped our farmers will

by one or other of the means which have been mentioned, soon have all the varieties which may be adapted to different soils and uses.

As the practice of sowing the land with wheat next after a crop of potatoes, is so important to the interest of the farmer, it may be expected it will become a part of our general system. In addition, therefore, to what has been remarked respecting the depositing of the potato tops for manure, the following practicable mode has been found very efficacious.

Before the digging is commenced, run a deep furrow near the row, turning the soil from them, deposit the tops in the bottom of the furrow; dig the potatoes, and then by turning a back furrow, the tops may be covered a sufficient depth to escape the teeth of the harrow. After the potatoes are dug, a single furrow on the row will be sufficient to prepare the ground for the reception of the seed. The vines placed in this condition will afford a good supply of excellent manure, and although it may not be so equally distributed to every part of the soil by this operation, yet the preference of this mode of securing the whole benefit of the manure, will more than compensate for this defect in its distribution. But when wheat is to follow the potato crop, the soil should have been rendered sufficiently fertile in the cultivation of that crop. The teeth of the harrow, in harrowing in the wheat, should be guaged, as may be necessary in many other uses of it, by putting them through pieces of slit work, or plank, laid on the top of the harrow, with holes for the teeth, that they may thereby be prevented from running so deep as to disturb the vines which are buried.

The practice of leaving potato vines on the field without being buried, whether wheat is to follow the potato crop or not, is slovenly, bad husbandry, a wanton waste of manure, and ought to be exploded by all who would sustain the reputation of good farmers.

CULTURE OF HOPS.

This plant requires a rich mellow soil, which should be prepared by digging or deep ploughing. "When a piece of land is intended to be planted, the first thing is to plough the

land as deep as possible in October, and to harrow it level; it is then marked each way with a four rod chain, placing pieces of wood or stick at every tenth link, to mark the place of the hills, which make 1000 per acre. This is the general method: but some few grounds are planted 800, and some 1200 per acre; some are planted wider one way than the other in order to admit the ploughing between the hills, instead of digging. But this practice, although it has been tried many years, does not seem to increase on account of the difficulty of digging along the rows, where the plough cannot go; that part being much trodden with the horses in ploughing, digs so much the worse that an extra expense is incurred, which in some measure defeats the economy of the plan. When the hills are marked out, holes are dug about the size of a gallon, which are filled with fine mould, and the nursery plants placed in them.

Some put three plants, others two, and some only one good plant to each hole. If the land is planted with cuttings, instead of nursery plants, the holes are dug in the spring, as soon as cutting time commences. Some fine mould is provided to fill up the holes, in which are placed four or five cuttings each about three or four inches in length. They are covered about an inch deep with fine mould, and pressed down close with the hand. When the land is planted with cuttings, no sticks are required, but if nursery plants are used they require sticks, or small poles, six or seven feet high the first year. In both cases the land is kept clear during the summer by horse and hand hoeing; the next winter dug with a spade; and early in the spring the old binds are cut off smooth, about an inch below the surface; a little fine mould is then drawn over the crown of the hills. As soon as the young shoots appear, so that the hills may be seen, they are stuck with small poles, from seven to ten feet long, in proportion to the length it is expected the vine will run.* It is said the poles should never be too long, as the vines never begin to bear much till they have got to the ends of the poles; that poles of ten feet are long enough for the first year; after that they are to be longer according to the strength of the ground, but never so long as that the vines cannot go somewhat beyond their tops. When the vine gets about two feet in length, it is the practice of some to tie them to the pole.

The proper time for gathering them is known by the hop rubbing freely to pieces, and the seed beginning to turn

* See Encyclopedia, v. 1, p. 302.

brown; about the first of September is the time generally in New-England. If gathered later, the vines will bear more the next year, but the present crop will not be quite as good. When the poles are drawn to be picked, it is advised to cut the vines asunder three or four inches from the ground, for cutting lower while they are green, weakens the root by too great a flow of sap. When large crops are raised, the best way to dry them is on kilns; but they may be dried on floors under cover, or in the sun, though it is said they will not be so well flavored as when kiln dried. When kiln dried, the fire should be kept on a moderate heat, for if it steams the hop brown it will be injured. They should lie about six inches thick and be frequently stirred while drying. The seeds will crackle a little when bursting, and then if the hops have been equally exposed to the heat they are all sufficiently dried.

Before they are put into bags they should be laid in heaps three or four days, to sweat and grow tough. Those who raise them for market, should procure bags of coarse linen cloth about eleven feet long and about two and a half yards in circumference, which should contain about 250 lbs. of hops.

The best poles are those which are most durable. Each pole should have three vines and all above this should be broken off in the spring. Mr. Young is of the opinion that a hop garden will last almost forever by renewing the hills that now and then fail; but that the better way is, to grub it up and new plant it once in about twenty five years. The seed of the hop is found to be the strongest part, and care should therefore be taken that they are gathered so soon that these will not fall out while gathering.

The long white hop is preferred, but care should be taken that they are all of one kind, for of different sorts some may ripen quicker than others. When bog meadows are well drained, hops will grow well on them. The culture of hops, where proper attention has been paid to it, has been found to be very profitable; at the prices they have commanded in this country, an acre of them has produced from two to three hundred dollars, and the whole expence per acre for raising them cannot be supposed in any instance, to exceed one hundred dollars; and they have always been found a profitable article for exportation. But very considerable quantities are wanted for our breweries at home; and they are of considerable importance, as a necessary article in the beer made for domestic uses, which is an excellent beverage, and a fine substitute for cider.

CULTURE OF ARTIFICIAL GRASSES.

The term artificial grasses, has been defined to imply a selection from the promiscuous family, and a culture, by human art, of the kinds best adapted to the soil and climate of the country, in preference to a reliance upon the grasses produced naturally. The great value of this selection is illustrated by the contrast between the crab of the wilderness and the cultivated pippin of the orchard; or by a comparison between the esculents of the garden and those of spontaneous production.

It is remarked by John Taylor, of Caroline, in a paper communicated to the Agricultural Society of Virginia, that an improvement of the soil by the culture of artificial grasses, arises from the vegetable matter of both root and top, when ungrazed; from the former when grazed; from protecting the grounds against heat in summer, and cold in winter; from producing food to create animal manure; from rendering the ground fit to bear deeper ploughing, by reason of the mass of vegetable matter mingled with it, that it can bear in a naked state, by which its soil is deepened; and from saving four-fifths of the farm from the hoof and the tooth, by making one fifth far more adequate to supply the demand for grass, than the whole without such cultivation.

The artificial grasses enable the farmer to raise meats of all kinds, for his own use and for the market, of the best quality, in the cheapest modes, and to increase the size of all animals destined to slaughter or labor. By a skilful management of artificial grasses, the manure they cause domestic animals to produce, will more than repay in the improvement of the soil and increase of crops, the expence of their maintenance. Men chiefly subsist upon grain and meat; brutes upon grass, grain, or dry hay. The difference between the expence of cultivating an acre of grain, and one of grass, is inconsiderable; and yet the latter will raise far more meat, butter, tallow, leather, and wool. Grass being the basis of food in the case of stocks, as bread stuff is for man, that mode of obtaining it which produces the most and best, with the least injury to the land, and from the smallest space, is entitled to the preference.

The artificial grasses, also, produce considerable profit by saving labor.

But the greatest benefit from the cultivation of artificial grasses, arises from their exclusive capacity to make high land meadows. The expence of clearing and draining the latter, will generally exceed that of manuring the former; yet the draining is considered every where as highly profitable and

useful. The comparative expense between that and making high land grass, is not materially affected by the probable comparative profit. A good spring crop of high land grass, is more common in our climate, than of low land, and is not exposed to inundation. A pound of high land grass, green or dry, generally contains as much nutriment as two of low land. It is more easily made into good hay. And high land grasses possess the great exclusive value of enriching the high and dry land on which they are sown. These considerations disclose items of profit, resulting from the culture of artificial grasses, which, when united, warrant the conclusion, that it is capable of rendering a great proportion of our high, dry, and hilly land as valuable as reclaimed meadow land.

After these general remarks respecting the utility of artificial grasses, it is necessary, for the purpose of forming a correct opinion on this subject, to take a view of the several kinds which have been cultivated in Great Britain, and some parts of the United States, together with the mode of culture, and soil most suitable to them, respectively.

The science on this subject, as it may be applicable to our country, has been well digested in a work lately published, entitled the Farmer's Assistant, a compendium of which shall be here inserted.

LUCERN, (*Medicass Saliva*). This grass is very highly esteemed for soiling, though it makes good hay if cut quite green. Mr. Livingston, of New-York, has made considerable trials of it in that State, and the products have, in some instances, been greater than those mentioned by British writers. With the best cultivation and plentiful manuring, from six to nine tons of hay, per acre, may be had in a season, of this grass. Twenty pounds of seed are requisite for an acre, if sown in the broad cast, or six pounds if drilled. If cultivated in the latter way, it is to be ploughed and hand hoed three or four times in the season; but perhaps the broad cast is the more profitable, when labor is high. Mr. Young recommends sowing it with oats; first sowing and harrowing in that grain, and then sowing or drilling in the lucern, and covering it lightly with a light harrow. Others, however, advise that the ground be previously well prepared by deep, frequent, and effectual ploughings; and that the seed be sown by itself. And as it is essential that the ground be well seeded, perhaps this is the best way. Mr. Livingston sowed it in the fore part of September, after a crop of early potatoes, and found it to answer very well, if the ground be prepared for it by summer fallowing at this time. The essential points in preparing the ground are

first to manure it well, and then to have it frequently and deeply ploughed, and well cleared of the seeds of weeds. A dry loam, sandy or gravelly loam, rich sand, or other good dry soil, is suitable for it: it is said to grow well in the coldest climates; but those which are mild are most suitable for it. It is a very early grass, endures drought well, and grows very late. When ground has been well prepared for flax, this grass will be sowed to advantage immediately after that crop.

During the first season of its growth the product will not be so large as afterwards; in this season, too, when cultivated in the broad cast way, it is most infested with weeds, which are most easily destroyed by frequent mowings for the purpose of soiling. The mowings may be as often as the grass will fill the scythe. During this season, too, it will be much hurt by being pastured; but after this it may be fed without injury.

Sometimes this grass becomes diseased and turns yellow; in such case, let it be mowed immediately, and it will then start as fresh and green as ever.

Mr. De La Bigarre says, that after this grass has stood two or three seasons, it should be well harrowed early in the spring; and if the roots are considerably torn by the operation they will not be injured. This should be repeated every second spring afterwards, and at these times the ground should previously have a good top dressing, which will be well mixed with the soil in the operation of harrowing. The dressing should not be of barn dung, but some manure, or compost, free of the seed of weeds. Bog durt, bog marle, mud, &c. are good for this purpose. Gypsum may well be applied every spring, but not before the harrowing, as this manure should never be buried in the soil. Mr. Young, of Great Britain, makes a computation of his expenses in cultivating one acre of this grass in the drill way; and after deducting the expenses and rent of the ground, tythe and rates, he makes the clear profit of 9*l*. 18*s*. 4*d*. sterling. Mr. Livingston has also made a similar computation of some cultivated by him in the broad cast, the result of which was not very far different, though the value of the crop was in this case set much lower than that put upon it by the former gentleman. This grass lasts about ten years, when the ground should be ploughed up, and it will then be found very rich, as the crops do not materially exhaust the soil.

It is believed by some that for soiling, in particular, this grass will be found more productive and profitable than any other, where the highest cultivation and a suitable soil are given to it, and where the climate is suitable for its growth. It has been observed by Mr. Young that for fattening bullocks, and for

pasturing swine, this grass may be very advantageously used. When it is made into hay, let it be cut while quite green, and made without much shaking about, as the leaves fall off considerably when dry. A little salt added to it when laid down in the mow would no doubt be a great improvement.

SAINTFOIN will grow well on dry stony soils, that are unfit for any good cultivation, and will produce on the waste lands a ton of hay, beside considerable aftermath, in the season. On good dry lands the product will be much greater. It may be used for soiling during the forepart of the season, and mowed for hay in the latter part. The hay will fatten horses considerably, as is said, without the aid of oats. It increases the quantity of the milk, and some say of the cream also; while the butter is improved in its color and flavor. Saintfoin requires a soil free of weeds, as for lucern, and the ground should be well mellowed by deep ploughings. The seed may be sown with the drill or in the broad cast; three bushels being allowed to the acre in the former method, and at least four in the latter. The seeds should be fresh and sown early in the spring. Those which have a bright husk, a plump kernel, which is bluish or grey without and greenish within, are the best. It is believed to be the better method to sow from one to three bushels of this seed, with about five pounds of common red clover to the acre; as the clover serves to keep down the weeds till the saintfoin has become well rooted. The seeds may be sown with oats or barley.

During the first season of its growth, no cattle should feed on it, nor should sheep during the second season. At the end of six or seven years, and afterwards, the ground should have such top-dressings and harrowings as is directed for lucern, and let gypsum be also applied every other spring.

If the first season for mowing proves wet, let the crop be left for seed. It is at no time to be cut before it is in full bloom.

BURNET, (*Poterium Sanguisorba*), is mostly used for early sheep feeding, though it may be advantageously used for soiling cattle, as it is hardy, is little affected by drought or frosts—and will even vegetate in moderate winter weather. If seasoned for hay, it must be cut early, or it will become too coarse. It requires a dry soil and may be sown with the drill or broad cast. It is essential to have good seed, for which purpose a spot for raising it should be selected. When a crop is designed for seed, let the ground be fed till sometime in May, otherwise the grass will be too rank for seed. These should be gathered while moist with dew, and threshed out in the barn as soon as they can be dried there. They may be sown any time before

August, after the ground has been well prepared. The following season the crop is to be kept clear of weeds by the harrow; and after that it will grow so strongly as to keep down all other growths.

CICHORY, (*Chichorium Intibus*), commonly called Wild Succory, has been but lately cultivated; but on poor blowing sands and weak dry soils, Mr. Young thinks it superior to any other plant, and that if sown with burzet and cock's-foot, it will form a layer for six or seven years, far exceeding those made of trifol, ray grass, and white clover. It grows more luxuriantly than burnet, lucern, or saintfoin, and may be often cut for soiling during the summer, twice during the first season, and three or four times afterwards, or every second month till October. It may be made into hay, which is coarse, but tolerably nourishing. Its principal use, however, is for soiling and for sheep feeding, as it is less injured by close feeding than most other vegetables.

Mr. Young advises that it be drilled at the distance of nine inches on poor lands, or twelve when the soil is richer, after the soil has been first duly mellowed. In this case it will be greatly improved by an occasional scarifying. It may also be sown with oats, in the broad cast; but for soiling, it is best sown in the fore part of the season, and lightly harrowed in. It produces plenty of head, which is easily gathered.

SPURRY, (*Spargula Arvensis*), has been considerably cultivated in Flanders, on account of its growing very late in the fall, and even during winter, and affording good food for sheep and cows. Cattle are very fond of it. It flowers from July to September; and is best suited to sandy and other dry soils.

THE BUSH VEICH, (*Vicia Sepium*), is said to shoot earlier in spring than any other artificial grass; it grows late in autumn, and in Great Britain retains its verdure through the winter. Mr. Sawyer states the amount of its produce, per acre, to have been about twenty-four and an half tons of green fodder, equal to about four and an half tons of dry hay. The culture of this plant was long since recommended by Anderson, but the principal difficulty seems to be in collecting the seeds, as the pods burst when ripe, and thus scatter them before they can be conveniently gathered. Doct. Withering, also, observes, that the seeds are often destroyed by the larvæ of a species of catelabus,

TARES, (*Vicia Sativa*), a kind of Pea. Of these there are two varieties, the winter and spring tares. The spring tare is to be sown as early in the spring as the ground can be well prepared, and the winter tare early in September; each at the

rate of about eight or ten pecks to the acre, broad cast, or about half that proportion for the drill. Each kind is good for feeding cattle of every description, particularly the winter tare, which in Great Britain, comes into use just as the turnip crop is exhausted. This plant is not proper for making into hay, being greatly injured by wet weather, and requiring more than common pains to dry it. The seeds of the different kinds must be carefully kept apart, as they cannot be distinguished from each other.

THE BROAD LEAVED VEICH, OR EVERLASTING TARE, (*Lathypus Latifolius*,) was long since recommended by Dr. Anderson as promising to afford large crops of hay and grass. It is eaten eagerly by cattle, and often grows to the height of twelve feet.

THE TUFTED VEICH, OR TARE, (*Vicia Erracca*,) attains considerable height, and produces abundance of leaves. This sort and the wood vitch, (*Vicia Eraeca*) attains considerable height and produces abundance of leaves. This sort and the wood vitch, (*vicia sylvatica*,) which rises from two to four feet high, are said to restore weak or starved cattle sooner than any other vegetable known.

THE STRANGE VEICH, (*Lathyroides*,) has been strongly recommended by Mr. Ames, as affording a tender and agreeable food for sheep.

CLOVERS. Of these the following are the most valuable which are known and cultivated.

TREFOIL, OR COMMON RED CLOVER, (*Trifolium Pratense*,) which is commonly cultivated in the United States. It grows well on all dry soils. About ten or twelve pounds of seed are requisite for an acre. It is generally sown in this country with barley, oats, or spring wheat, when that article is raised, or it may be sown with winter wheat in the fall, if the land be dry and warmly exposed; or in the spring when it should be lightly bushed or harrowed in. It is peculiarly excellent for forming a lay for a crop of wheat; which may be sown to great advantage on the clover sward, when properly turned under.*

All kinds of cattle feed and thrive well on it, either in pastures, when soiled on it, or when fed on the hay.

It is said also, that it will keep swine well through the winter, if well saved, early cut, and steam boiled, before it is given them.

RED PERENNIAL CLOVER, OR COW GRASS, (*Trifolium Medium*,) is cultivated in Great Britain, in almost every kind of good

* See essay on wheat, and rotation of crops.

upland soil, even in heavy clayey lands. It is to be sowed in the spring with oats, bailey, &c. It is also usual to sow it there as well as the common red clover, with the crop of flax. It rarely succeeds when sown by itself. It produces abundance of seeds, which are easily collected.

HOP CLOVER, (*Trifolium Procumbens*,) grows naturally in Great Britain, in dry meadows and pastures. It is recommended for laying down land to grass by mixing it with the clover last mentioned and the

WHITE CLOVER, (*Trifolium Repens*.) This grass grows spontaneously on dry uplands, after they have been manured with gypsum, or with bog marle, &c. It is a very sweet grass for pasture or hay, but not very productive. It is generally short lived, but may be made to last longer by passing a roller over it; for where the stalks come in close contact with the ground, new roots will start and descend into it. It is cultivated in Great Britain for sheep pastures, and for other uses. It is most useful in mixing with other grasses for the purpose of thickening the growth at the bottom, and thus increasing the product.

In laying down lands to grass of every kind, the ground should be made mellow and fine; the seed should be clean and good, and sowed evenly and plentifully, and lightly covered, and the ground made perfectly smooth, particularly where it is intended for mowing and soiling. The graziers of Great Britain in laying down their grass lands, make use of much more seed than is usual in this country. The quantity which may be most profitable to sow on a given surface of soil can best be determined by experiment. Let one square rod of ground properly prepared be laid down with a given quantity of seed; another square rod with a greater quantity; and another with a still greater; then carefully gather and weigh the product of each square rod separately, and if that which has most seed has an increase of product sufficient to pay for the extra seed, and about thirty per cent. more, that quantity of seed may be most advisable to give the ground. In the same way it may be ascertained how far it is profitable to sow the ground with different kinds of grasses, in order to increase the product of the whole. This practice is much attended to in Great Britain, as will be seen by the following directions of Mr. Young and Mr. Tallet, for laying down particular soils to grass. Mr. Young directs for an acre of clayey land, the following grasses and proportions of each: of cow grass, five pounds; trefoil (common red clover,) five do.; dog tail, ten do.; and of fescue and fox tail, one bushel.

For an acre of loam, of white clover, five pounds ; dog's tail, ten do. ; ray, one peck ; fescue, three do. ; and of yarrow, two ditto.

For an acre of sand, of white clover, seven pounds ; trefoil, five do. ; burnet, six do. ; ray, one peck, and yarrow, one bushel.

Mr. Tallet directs that for an acre of such dry light soil as is adapted to the culture of turnips, the following proportions of seed be given :

Of smooth stalked poa or meadow grass, six quarts ; ray grass, four do. ; dog's tail, six do. ; yellow oat grass, four do. ; cock's foot, two do. ; vernal grass, one do. ; cow grass, three do. ; white clover, two do. ; rib grass, two do. ; and of yarrow, two do.

Again, for such soil as is of the moister kind of upland, he allows for an acre, of fox tail, six quarts ; rough stalked poa, six do. ; vernal grass, one do. ; cow grass, three do. ; white clover, two do. ; rib grass, two do. ; and of rib, two do.

When the water lies longer, he directs the composition to be as follows :

Of rough stalked poa, two pecks ; fox tail, two do. ; meadow fescue, two do. ; flote fox tail, three quarts ; and of flote fescue, four do. ; and for situations still more wet, the following : Of rough stalked poa, two pecks ; fox tail, two do. ; flote fox tail, one do. ; and of flote fescue, one do. The above are given merely as specimens of the quantities of seeds advised to be apportioned to different soils and of the several kinds which are deemed most suitable, in Great Britain. It does not follow that the same sorts of grasses and the same proportions and quantities of the seeds of each would here be found most proper in similar soils : as our summers are warmer and our atmosphere less moist than theirs. These are matters which are proper subjects of inquiry with the experimental farmer. It is believed that the British farmers and graziers give their grounds more seed than will generally be necessary in this country.

What is usually termed meadow land has been ever considered as almost an indispensable appendage to a farm ; and without a proportion of such land the farmer supposes he cannot procure a suitable supply of hay ; but although such meadow land seldom fails of producing a crop of hay, yet the quality of such hay is vastly inferior to that produced by cultivation ; and even the quantity too is often much less ; and the land totally lost to the production of any other crop. On what is called good natural meadow you may often find ten or twelve different species of grass within the compass of a few rods square,

and not more than one or two of them that are noticed as furnishing food suitable for the sustenance of stock, while many rushes, mosses, &c. are found growing on the same spot which are of no value whatever.

It is certainly then worthy of great consideration whether the farmer should not make it more of an object to cultivate his grass as well as his grain. It is well known that grasses grown on dry or arable land, are of a quality vastly superior to those of natural meadow, and it appears from the above account of the artificial grasses, that even a much greater quantity of good hay may be obtained by cultivation from the same quantity of land. Besides, the system, if it is properly pursued, will have the effect to increase the quantity and quality of all his other crops, to a degree more than sufficient to compensate him for all the extra labor and expense.*

There are several other kinds of grasses, which do not so properly belong to those which are denominated artificial, because they will grow and flourish longer without cultivation; among these are the following.

MEADOW CATS TAIL, TIMOTHY GRASS, OR HERDS GRASS, (*Phleum Pratensis*,) the grass most used for hay in the northern states. It is sometimes called fox tail, but this is another grass. The cats tail has a long head, somewhat resembling the tail of a cat, with very fine seeds; the fox tail has a long bushy head more like the tail of the fox with coarse seed. In other respects they have considerable resemblance.

Cats tail grows best in rich moist soils but will grow well in a rich wet soil, or in a rich arable soil. In the rich wet soil it gradually lessens in product, while at the same time it gives way to wild grasses. In the rich arable soil it gradually fails by reason of the ground becoming bound and the sward thickened with other grasses. If it were considerably torn with the harrow every spring, and not too closely pastured in the fall, and none in the spring, it would grow well for many years in such soil. By close pasturing in the fall it is apt to be torn out by the roots; and by cropping it again in the spring, it suffers greatly. It will yield one half more if not pastured any, than when pastured closely in the fall and again in the spring. In the richest soils, and when not pastured, upwards of four tons may be had in a season at two mowings. It does not fertilize land so much as clover; but on the contrary binds and somewhat exhausts the soil. It is perennial and will last

*See essay on rotation of crops.

beyond the memory of man if not destroyed by close pasturing. Some believe it is most valuable for hay if cut when in blossom or soon after; others, when the seed is nearly ripe; and others again when it is quite ripe. But as the nourishment to be derived from it, is principally from the stock or blade, and not from the seed, it certainly must furnish a better hay for either cattle or horses, when cut soon after the time when it is in full blossom. When however it is intended to be continued a considerable length of time without ploughing, it might be well to let it stand some seasons until the seed is fully ripe, and by that means check, in some measure, the prevalence of weeds and wild grass.

MEADOW FOX TAIL, (*Alopecurus Pratensis*). This grass is much cultivated in Great Britain; it is an early grass and vegetates with such luxuriance, that it may be mowed three times in a year. The British graziers consider it one of their best grasses, particularly for larger cattle. The soil best suited for it is moist meadow land, or that which is occasionally overflowed, though it will grow well on almost any soil except those that are very wet, or very dry. Linnæus states it to be a proper grass for grounds, which have been drained. It is perennial, and yields abundance of seed, which is easily gathered. The seed is however sometimes liable to be destroyed by an insect.

MEADOW FESCUE, (*Festua Pratensis*) is an early hardy perennial grass, and grows well in almost every soil; good for hay or pasture, and produces abundance of seed which is easily gathered. Mr. Custis says it has a great resemblance to ray grass, but is superior to it in forming meadows, as it grows longer, and has more foliage. It blossoms about the middle of June.

DARNEL, OR RAY GRASS, (*Lolium Pereene*), is good for an early supply of pasture, as it starts very early. It grows to the height of about two feet, and blossoms the latter end of May. Horses are extremely fond of it when made early into hay; and for race horses particularly, has been found preferable to any other hay. It is however apt to run too much to stalks in most soils, and then cattle dislike it in pastures.

CRESTED DOG'S TAIL, (*Cynosurus Cristatus*), is good for upland pastures, and is a wholesome food for sheep. It forms a thick turf, and blossoms about the middle of June. It abounds with seed which is easily gathered; but care should be taken that it be fully ripe; it is suitable for dry sandy soils, and will not thrive in wet meadows.

MEADOW GRASS, (*Poa Pratensis*,) will flourish well even in the driest soils, and will endure drought better perhaps than any other grass. It makes fine hay and is fit for early cutting. It is also good for early pasture. It yields plenty of seed; but this is difficult to sow on account of their filaments, causing them to adhere to each other. To remedy this it is recommended to put them in newly slacked lime, to separate them, and then to be rubbed in dry sand.

VERNAL, or SPRING GRASS, (*Anthose Antiem Odoratum*,) is a very early grass for pasture, and grows in almost every situation, though not equally productive in each. It is an odoriferous grass, and is recommended by some to be sowed with other grasses, in proportion of about one eighth for meadow. It is not very productive.

MEADOW SOFT GRASS, (*Holcus Lanates*,) grows well on any soil not too dry and barren. It is best calculated for sheep in pastures. It is injurious to horses when made into hay, by producing a profuse discharge of urine, and general weakness, which may, however, be readily removed by a change of food. It is not a very early grass.

SHEEPS FESCUE, (*Festuca Ocina*,) grows well in dry sandy soils; is very good for sheep, as they are fond of it, and soon fattened with it. It is perennial, and flowers in June.

HARD FESCUE, (*Festuca Duricustula*,) flourishes in almost every situation, wet or dry, and blossoms in June. It grows luxuriantly at first, often to the height of four feet; but it soon becomes thin and disappears after a while. It is best for mixing with some other grasses.

ANNUAL MEADOW GRASS, (*Poa Annua*,) is in flower throughout the summer. Cattle of every kind are fond of it. It is recommended for milch cows, on account of its affording butter of a superior quality.

ROUGH STALKED MEADOW GRASS, (*Poa Trivialis*,) resembles the preceding in its appearance and its flowering, but is best suited for moist or wet meadows. It is very productive, and good for pasture or hay. It is however said, that it is liable to be injured by severe cold, or excessive drought.

FOWL MEADOW GRASS, (*Poa Avaria*, *Spicalis Lubbifloris*,) was first said to be discovered in a meadow in Dedham, and was supposed to have been brought there by water fowls, says Mr. Deane. It is an excellent grass for wet meadows, and has been known to yield three tons to an acre in a season. It remains so long green that it may be mowed any time from July till October. It makes very good hay for horses, and neat cattle particularly.

MEADOW GRASS, (*Poa Pratensis*), will flourish well even in the driest soils, and will endure drought better perhaps than any other grass. It makes fine hay and is fit for early cutting. It is also good for early pasture. It yields plenty of seed; but this is difficult to sow on account of their filaments, causing them to adhere to each other. To remedy this it is recommended to put them in newly slacked lime, to separate them, and then to be rubbed in dry sand.

VERNAL, OR SPRING GRASS, (*Anthose Antiem Odoratum*), is a very early grass for pasture, and grows in almost every situation, though not equally productive in each. It is an odoriferous grass, and is recommended by some to be sowed with other grasses, in proportion of about one eighth for meadow. It is not very productive.

MEADOW SOFT GRASS, (*Holcus Lanates*), grows well on any soil not too dry and barren. It is best calculated for sheep in pastures. It is injurious to horses when made into hay, by producing a profuse discharge of urine, and general weakness, which may, however, be readily removed by a change of food. It is not a very early grass.

SHEEPS FESCUE, (*Festuca Ocina*), grows well in dry sandy soils; is very good for sheep, as they are fond of it, and soon fattened with it. It is perennial, and flowers in June.

HARD FESCUE, (*Festuca Duricustula*), flourishes in almost every situation, wet or dry, and blossoms in June. It grows luxuriantly at first, often to the height of four feet; but it soon becomes thin and disappears after a while. It is best for mixing with some other grasses.

ANNUAL MEADOW GRASS, (*Poa Annua*), is in flower throughout the summer. Cattle of every kind are fond of it. It is recommended for milch cows, on account of its affording butter of a superior quality.

ROUGH STALKED MEADOW GRASS, (*Poa Trivialis*), resembles the preceding in its appearance and its flowering, but is best suited for moist or wet meadows. It is very productive, and good for pasture or hay. It is however said, that it is liable to be injured by severe cold, or excessive drought.

FOWL MEADOW GRASS, (*Poa Avaria*, *Spicalis Lubbifloris*), was first said to be discovered in a meadow in Dedham, and was supposed to have been brought there by water fowls, says Mr. Deane. It is an excellent grass for wet meadows, and has been known to yield three tons to an acre in a season. It remains so long green that it may be mowed any time from July till October. It makes very good hay for horses, and neat cattle particularly.

FLATSTALKED RED MEADOW GRASS, (*Poa Compussa*.) flourishes in dry soils, and flowers from June to August. It forms a fine turf, and imparts a delicate flavor to the flesh of sheep and deer, which animals are very fond of it.

SILVER HAIR GRASS, (*Aira Caryophy Cea*) is most suitable for sandy lands, and is recommended for sheep walks, on account of the fineness of the mutton of those sheep which are fed on it. It flowers in July. Mr. Tillingfleet applies the same remark to the waved mountain hair grass, (*Aira flexuosa*) which grows in heaths and barren pastures, and is in flower from June to August.

CREEPING BENI GRASS, (*Agrostis Stolonipra*) grows in moist lands, and is a good food for cattle. It grows with such luxuriance as to suppress the growth of moss and other weeds.

TALL OAT GRASS, (*Orena Elatior*)* flowers in June and July. It grows very large and coarse, and makes a pretty good hay, though horses are not fond of it. In point of excellence, Mr. Custis ranks it next to fox tail. In pastures it should be closely fed. It yields plentifully of seed. No doubt, a little salt applied to the hay made of this grass, when laid down in the mow, would be a great improvement to it.

Mr. Muhlenbergh, of Pennsylvania, recommends this grass very much, as one of the best he had cultivated. It would probably answer well for soiling, as it starts very early and grows very late.

YELLOW OAT GRASS, (*Avena Havesceus*) is also a coarse grass, which thrives in meadows and pastures, and on hills of calcareous soil, where it flowers in June and July. Though tolerably sweet, it is less relished by cattle than the poas and fescue grasses; though it is said, it makes good sheep pastures.

RIB GRASS; (*Plantago Lacinalata*.) It has been considerably propagated in some parts of Great Britain, where it is held in estimation. It is best adapted to rich sands and loams, and on poor sands it answers tolerably well for sheep. It is not liked by horses, and is bad for hay, on account of its retaining its sap. It is said by Baron Haller, that the richness of the milk in the celebrated daisies of the Alps, is owing to the cows feeding on this plant and the lady's mantle, (*alchemilla vulgaris*.) Its seed is plentiful.

COCK'S FOOT, (*Dactylis Glomerata*.) is a coarse grass, and grows with luxuriance. It suits all kinds of soils, but those which are very wet or very dry. It is said to afford an abun-

* This grass is sometimes called by farmers, Tall Oat Grass, sometimes Tall Meadow Oats, and also by some, Orchard Grass.

dant crop, springs early, yields abundance of seed, makes excellent hay, and is very permanent. It flowers in June. Where it grows on rank soils, however, or in coarse patches, cattle will not eat it.

BLUE DOG'S TAIL GRASS, (*Cynosurus Cæmlius*) is the earliest of all the British grasses, and flowers a fortnight sooner than any other. It is not very productive, but may be useful in sheep pastures, in high rocky situations, where there is but little soil.

The following Aquatic plants may be of some use to some of our citizens, in certain conditions.

FLOTE FOX TAIL, (*Alopecurus Geniculatus*) grows in meadows on the Severn, in Great Britain, where other good grasses are expelled by reason of wetness and inundations. It is a good grass for hay, and flowers in May and June. It is recommended for newly reclaimed morasses, and lands recovered from the sea.

FLOTE FESCUE, (*Festuca Fluitans*,) will grow in still wetter grounds than the flote fox tail, or rather may be said to be amphibious, growing as well in the water or otherwise. It flowers in June, and is a constituent part of the celebrated Orcheston meadow, in Great Britain. Horses and cows are very fond of it. It springs early, and promises to be useful for the same purposes as the last mentioned grass. The Cheddar and Cattenham cheese owe their excellence principally to this grass, and to the

WATER HAR GRASS; (*Aira Aquatica*) which is further said to contribute much to the fine flavor of the Cambridge butter. It generally grows in the edges of standing waters, and flowers in June and July.

REED MEADOW GRASS, (*Poa Aquatica*) is one of the largest and most useful of the British grasses, and forms much of the riches of Cambridgeshire, and other counties in England, where draining meadows by wind machinery, is carried on. It is good for pasture and hay, particularly for milch cows, though it is not relished so well by horses. It is strong, and well suited to low places, which are liable to be inundated. It grows to the height of six feet, but should be mowed when about four feet high. It may be mowed several times in a season. It grows plentifully in the marshes of Sandusky Bay, River Raisin, Detroit, and elsewhere, round the westerly part of Lake Erie, where it is the principal reliance for pasture and hay. The French farmers there, cut it and bind it in bundles, when dried, which seems to be similar to the management of it, in the parts where it is cultivated in Great Britain.

It is not supposed that it will be found necessary to introduce all the grasses which have been here enumerated, into general use.* But it was thought expedient to describe them, because the great diversity of the condition of our citizens, especially of the locality of their situation, may, if not even at the present time, at no very distant period, render the knowledge of them interesting. But it may be easily conceived that a better knowledge of those grasses already in general cultivation, will be requisite, when we understand and practise the system of husbandry connected with the plan of rotation of crops, and that also of making improvements by the turning in the green crops for manure.

BUCKWHEAT.

It may be observed respecting this kind of grain, that it will grow on a soil perhaps less fertile than any other, and with the nourishment which may be derived from a little gypsum, crops of it may be raised year after year on the same spot of ground.

In those parts of the United States where chesnut trees grow, it has been found, from long experience, that the proper time for sowing the seed is when that tree is in full blossom. But for a general rule, it may be sown about the time when herds-grass first begins to blossom, or a little sooner in more northern climates. It requires about half a bushel to the acre. But this, like all other crops, would require that the quantity of seed should be increased or diminished, according to the strength of the soil.

Spring rye may be sown with buckwheat, and a crop of each may be produced together, which will constitute a very good food to assist in the fatting of hogs. It answers also a good purpose to feed to horses and fowls. But as it may be often raised where other grain cannot be procured so easily, it is worthy of attention, in consideration of its answering a valuable

*The artificial grass seeds which have been enumerated, or any other seeds mentioned in these essays may be obtained from the

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purpose for making cakes, which when warm are esteemed as a good substitute for more expensive kinds of bread, and are even used by many out of choice. The raising of buckwheat for the valuable purpose of preparing the soil for a crop of wheat, should be kept in view.*

Some farmers have practiced sowing rye invariably after buckwheat; and some have sown the rye in July with their buckwheat, which, it is said, keeps the rye down so as to prevent its being too forward when the buckwheat comes off. This is a labor saving culture, and good crops of rye have been raised in this way; but it is believed to be better husbandry to plough up the ground after the buckwheat comes off.

It is useful in driving out the azeyed daisy, butter cup, crow foot, Canada thistle, and other noxious weeds, as well as the quack grass, or couch grass.

PEA.

Peas, of all kinds, for family use, may be sown in the field, in the broad cast way, and the farmer, who has land plenty, may raise them cheaper, and with much less trouble. It is said that the German farmers attend much to the culture of this pea. An average product is about eighteen bushels to the acre. They preserve the haum to feed their cattle, which may answer as a substitute for other food when it is scarce.

The culture of the pea should be more attended to in the United States, when it is considered, that the crop, though of less value than many others, does not much exhaust the soil, and does no injury to the crop of wheat, which may succeed it. By such culture, the farmer may gain an extra crop from the land which he intends for sowing to wheat the next fall.†

A bug is often found which, has eat into the heart of the pea; although it does not prevent the growth of them, they will injure the next crop, if they are not destroyed. One method to kill them is to let the peas be thrown into hot water, and after remaining there a few seconds, take them out

* See essay on the culture of wheat.

† See Essay on wheat.

and let them be dried and sowed immediately. The same means too may be used to prepare them for cooking, and the bugs will drop out after they are dead, and are then easily separated from the peas. In that case however, they should be kept longer in the hot water.

The time for sowing any kind of peas is as early in the spring as the ground can be well prepared. A dry soil is the best for them. The quantity usually sown upon an acre is two bushels. Some sow three; and as a reason for sowing the latter quantity, they say that by growing thicker they will be less liable to fall flat on the ground, which has a tendency to prevent the pods from filling.

It is difficult to cover peas with the harrow; they should be ploughed in. It has been said by Lord Kames that peas laid a foot below the surface will vegetate; but that the most approved depth is six inches in light soil, and four inches in clayey soil.

The following remarks of Mr. Bartram, of Pennsylvania, a distinguished naturalist, respecting the bug in the pea, may lead to some means by which their mischievous effects may be avoided; "They feed, when in the caterpillar or grub state, on the green garden or field pea as soon as the pods have arrived to a state of maturity, sufficient to show the peas which are within them. In the evening, or on a cloudy day, the female deposits her eggs on the out side of the pods; these eggs or nits soon hatch, and the young larva, or worm eats directly through, and enters the tender young pea where it lodges, and remains feeding on its contents, until it changes to a crysalis, and thence to a fly or beetle, before the succeeding spring; but do not eat their way out until the cold and frosts are past, about the beginning of April, when we generally begin to plant peas." After they have disseminated their eggs, they perish. But that which is surprising and difficult to be accounted for, is that the worm leaves the rostellum, or sprout, untouched, or at least uninjured; for almost every pea vegetates and thrives vigorously, notwithstanding the corculum (the rudiment of the young plant) Plumula seem to be consumed. J. Peckering, of Wyoming, in Pennsylvania, sowed the early charlton and green marrow-fats, in his garden, in 1789, the first week in May; the first had green pods in July; the marrow-fats came later. Some of both kinds were left to ripen. The seed oft he earliest in the spring following were found swarming with bugs, those which were later had none. He afterwards sowed his field about the 20th of May, and the crop was free from bugs. He thought the obvious inference was that this mischievous in-

sect is limited to a certain period for depositing its eggs ; and that if the tender pods are not found till that period is passed, the peas will be free from bugs. Wyoming (now Wilkesbare) is in latitude 41 degrees, 13 minutes. The active flight of the pea bug will be doubtless earlier there than in more northerly regions.

CULTURE OF FRUIT-TREES.

If success is expected in raising fruit-trees, much attention is necessary, both in the planting them, and afterwards in their preservation.

In taking up the tree from the nursery, care should be taken to dig away the earth around the roots, so as to come at their several parts to cut them off; for if they are torn out of the ground, as they frequently are, the roots will be broken and bruised, to the great injury of the trees. To prepare them for planting, all the small fibres are to be cut off, as near to the place from whence they are produced as may be, excepting, perhaps, when they are to be immediately replanted as soon as taken up. But it will require great care to plant them in such a manner as not to distort or entangle the fibrous roots, which will be worse for the plant than if they were cut off. All the bruised or broken roots, all such as are irregular, and cross each other, and all downright roots in fruit-trees, should be pruned off. The lateral, or side roots, should be shortened in proportion to the age, the strength, and nature of the trees. The walnut, mulberry, and some other tender rooted kinds, should not be pruned so close, as the more hardy sorts of fruit and forest trees. In young fruit trees, such as pears, apples, plumbs, and peaches, that are one year old from the time of their budding, or grafting, the roots may be left only about eight or nine inches long. This is only to be understood of the longer roots.

In pruning their heads, prune off all the small branches, and irregular ones which cross each other; also all such parts of branches as have been broken or wounded, leaving only the main leading shoots which are necessary to attract the sap from the root, thereby to promote the growth of the tree.

If they have been long out of the ground, before they are planted they should be placed in water, with their heads erect, the roots only immersed, by means of which the roots will become swelled and prepared to imbibe nourishment from the earth.

In planting, regard should be had to the nature of the soil ; if it be cold and moist, the trees should be planted very shallow ; if a hard rock, or gravel, it will be better to raise a hill of earth, where each tree is to be planted, than to dig into the rock or gravel, and fill it up with earth, as too often practised ; by which means they have not sufficient room to extend their roots. The earth with which the hole is filled up, should be broken with the spade, that it may fall between every root, so as to leave no hollow places in the earth. In transplanting trees, especially large ones, Mr. Forsyth considers it to be of great consequence that they be placed in the same position, having the same parts facing the same points of compass as before they were removed.

In deciding on the proper distance of trees in an orchard, it should be considered that they should be set so far apart that their limbs will not be likely to interfere with each other, when they arrive at their full growth.

In a soil best suited to their growth, in which they will become largest, thirty-five, or even forty feet will not be too much.

It is said that after an orchard is planted, it is best to keep the land continually in tillage, until the trees have begun to bear plentifully.* But great care should be taken that the roots be not disturbed by ploughing, nor the bark on the stems of the trees wounded ; and the ground near the trees which the plough leaves, should be broken and made mellow with the spade, for two or three years, before the roots have far extended.

* Any use to which an orchard should be appropriated, besides that of procuring fruit, must depend on the condition of the farm. It may be expedient to appropriate it to pasture the fore part of the season, or to meadow ; but the growth of the trees when circumstances will admit, is best promoted by tillage, as above directed.

PRUNING OF FRUIT-TREES.

A writer, whose essay on the subject of apple-trees, is published in the Massachusetts Agricultural Repository,* mentions three modes of mismanagement which injure orchards. 1. Beginning to prune them in March, when there is still much wet and frosty weather, and no activity in the sap of the tree. 2. The old practice of hacking and mutilating apple-trees in a manner ruinous to an orchard. It is, says he, an universal practice among the old farmers, to mount the tree with a hatchet, or bill-hook, and hack off any branch which is in a state of decay, or which is misplaced, about six or eight inches from its insertion, leaving a stump to rot, and to operate as a conductor of the water, frost, and canker, into the mother branch in which it grew, or into the body of the tree, according to its situation. This was done originally from an idea that if you cut close to the mother branch, or to the body of the tree, the rot, or canker will seize more readily on its trunk, than if cut at a distance, and that the tree will decay the sooner. The practice has been followed without reflection, and without reason by many.

The error is obvious, as any man may learn by making his experiments on a young tree. This writer advises the farmer, when he has fixed upon a limb to be lopped off, if it is large and heavy, to cut it first at some distance from its insertion, to prevent its weight, in falling, from lacerating the bark at the shoulder, whence your final cut is to be; because this leaves an opening for water to get under the bark, and cannot easily be healed. You may now saw the stump close to the branch from whence it proceeds, with safety; or if it be a portion of a branch which is to be lopped off, the cut should be down to a sound healthy lateral branch, growing from the same limb; or if the limb to be cut off, proceed from the body, or trunk of the tree, then it should be sawed close to the shaft. The wood in all cases, should be smoothed over, and the edges of the bark carefully pared with your knife or hatchet, so that the water will run off the wound. If the cut be made on a lateral branch, it should be sawed obliquely, or slanting, so as to leave no dead wood, or wood to die, and in all cases the cut should be on a sound and healthy part of the tree. If the branch on which it is cut is a healthy, vigorous one, it will heal without difficulty, if pruned the last of April or beginning of May; but if in March, the wound should be covered with a compost;

* Vol. v. p. 121—127.

but if the wound is large, so as to require several seasons before it can heal entirely, it will be better to apply the compost, whether it be pruned in March or later.

Third error consists in the habit of encouraging luxuriant upright branches, to the great injury of the natural horizontal fruit-bearing branches; these are very properly called glutton branches, because they consume the sap which would otherwise go into the lateral and fruit-bearing branches, and in the course of a few years, they leave the fruit branches decaying and decayed; the farmer then resorts to his axe, cuts away the dead and dying wood, and leaves the glutton in full possession of all the nourishment which the roots afford; but in return this voracious member of the orchard gives no fruit until many years, and then it is of an inferior quality.

To prevent this, the cultivator should suppress all the stiff, upright shoots, the first year they appear, by cutting them off down to the branch from which they issue; taking care not to leave the shoulder of the shoot, as he will in such case have the same duty to perform again; but if the shoulder of the glutton be cut away, the sap will be distributed among the lateral fruit-bearing branches, which will be kept in vigor, and continue in a healthful bearing state.

The compost best suited to cover the wounds of all trees, is a composition of tar, beeswax, and red ochre, boiled and simmered for half an hour or twenty minutes together. The proportion recommended, is a pint of tar, and a piece of beeswax as big as an English walnut. When these are incorporated, scatter a small quantity of pulverized red ochre, say half a gill, and stir them well together while boiling hot, or simmering. When this compost is cool, it should be stiff enough to resist the heat of the sun sufficiently to prevent its running, and yet soft enough to be applied to the wound with a small, flat, smooth stick; it will last two years without renewing; it yields to the sap as it issues from under the bark round the wound to cover it, while it continues to protect both the wood and the edge of the bark from water, and of course from decay.

To prevent the decline of fruit trees, washing and rubbing their bodies with soft soap has been used with success, on apple trees, pear trees and peach trees. It is used in the spring, and repeated the following years as often as the trees seem to require it. It is also recommended to whitewash the bodies of fruit trees in the spring with a mixture of lime and water.

The following composition for curing defects in trees, and restoring old decayed ones, is recommended by Mr. Forsyth, as being very efficacious.

Take a bushel of fresh cow dung, half a bushel of lime rubbish from the ceilings of old rooms, which is best, or pounded chalk, or old slaked lime will answer, half a bushel of wood ashes, and a sixteenth of river sand; sift the the three last articles fine before they are mixed; work them well together by beating, &c. so as completely to mix them: Then reduce the mass to the consistence of thick paint, by mixing with it a sufficient quantity of urine and soap suds, so that it can be used with a brush. A good coat of this is to be applied to the naked wood where a limb is cut off, or the wood otherwise laid bare, and the powder of wood ashes and burnt bones is to be sprinkled over this and gently pressed down with the hand. With this he restores all rotten decayed trees to a flourishing state. To effect this, all the rotten and dead part of the tree is first cut away and scraped out quite down into the roots, till you come to the live wood, and then smoothed, and the edges next the live bark rounded off. The composition is then laid on with a brush, and covered as before directed with the powder. As the bark of the edges grows over this covered wood, it works off the composition and supplies its place, till at length the bark of the two edges meet and grow together. If the growing bark should raise up any flakes of the composition, so as to expose the wood, let them be pressed down with the fingers some rainy day, when the composition is pliable. Where a tree would be too much weakened by cutting away all its dead wood at once, cut only a part away next the edges, and as the bark covers this, cut away more. Where limbs are cut off, let the stumps be pared smooth and the edges rounded, before the composition is laid on. He says this should always be applied wherever a limb is cut off, in order to preserve the tree from rotting at such places.

Fruit trees are subject to a disease called the canker. It occasions the bark to grow rough and scabby, and turns the wood affected to a rusty brown color. It will sometimes kill the tree if not remedied in due season.

This disease may arise from various causes; from bad pruning; from dead shoots left on the tree; from frosts killing the last year's shoots, &c.

The diseased parts are to be instantly cut away, till nothing but sound white wood remains; or if the disease be merely in the bark, the outer bark must be cut away, and if the inner bark be also affected, which is to be known by its exhibiting small black spots like the dots of a pen; cut all away that is thus affected, and let the composition be applied as before directed.

Fruit trees of the stone kind are frequently diseased with gum, which arises from bad pruning, bruises and other causes. The diseased parts are to be cut away, and the composition applied as before. *

Young apple and plum trees, in particular, are apt to get covered with what are usually called lice, an inanimate substance resembling an insect, of the color, and somewhat of the shape of a grain of flaxseed, but narrower. Where the bark is thickly covered with these, the growth of the tree will be very much impeded, and sometimes it will be killed if they are not removed. They are to be scraped off with a knife. Moss also should be scraped off, as it greatly injures the growth of the tree.

The washing the bodies of the trees with the mixture of lime and water as before directed is said to be very efficacious in keeping off moss, lice and other noxious substances.

Perhaps the composition before mentioned, would be equally good. †

It is a general complaint, that the finest apple trees of this country have degenerated, and that many of the best sorts have entirely disappeared from our gardens and orchards. It would not be difficult to show that every successive grafting deteriorates the part engrafted; or to point out an effectual method of retaining good apples in this country without the trouble of engrafting, as in every perfectly ripe apple there will be found one or more seeds with flatted sides. The round ones will produce the improved fruit from which they are taken, and those with the flatted sides will produce the fruit of the crab upon which the graft was inserted. If a circle is drawn in rich ground, and the flat sided seeds planted therein, and the round seeds in the centre, the variation of quality will be discovered in two or three years. The first will throw out the leaves of a crab, and the latter of an improved tree, distinguishable in shape and fibre, and with a wooly appearance; and in due time the fruit of each will put every thing beyond doubt. It is observed that the seeds of crabs (being originals) are mostly if not altogether round. ‡

If this rule for pruning the original qualities of fruit trees, should not prove universally infalible in its operation, yet it suggests to our consideration, the practibility and expediency

* Forsyth on fruit trees.

† See Farmer's Assistant, title fruit trees.

‡ European Magazine.

of improving our fruits generally by paying more particular attention to the seed from which our nurseries are produced.

The method of grafting to improve fruit, cannot be practiced, so extensively, as generally to improve the quality of our cider, without much labor, and often too, for the want of that science necessary to its success.

It will be seen from what has been remarked on this subject that the mismanagement of the apple tree begins in the nursery; and first by paying little or no attention to the seed, and on transplanting them by leaving suckers from the roots, and by leaving branches for two or three years, which must eventually be cut away, when by their increased growth, they will force a more injurious amputation: then by squeezing them into small holes so as to cramp the root, where the hole ought to extend at least one foot beyond the longest roots and the mould to be made quite mellow. Then by neglecting or mismanaging, so as to let them get into a stunted and decaying state by suffering the ravages of insects upon them, or from want of giving them proper nourishment, and bad pruning.

It is not strange that under such circumstances, our orchards are so generally made up of a mongrel kind of degenerated fruit, neither delicious to the taste nor capable of making good cider.

It is the duty of the philanthropist as well as the farmer, to endeavor to cultivate the apple tree with diligent skill, as it yields a fruit equalled by none in abundance and excellence, and a liquor which if properly made, is little if any inferior to the best wine. Besides it would, by discouraging the general use of ardent spirits, have a tendency to promote the health, and protract the lives of those who might be useful in society, and by expelling foreign liquors, be a great saving of national wealth.

MAKING AND IMPROVING CIDER.

In making cider, the mill, the press, and all the materials should be sweet and clean, and the straw free from must. The fruit should be ripe, but not rotten; and for making the first

rate cider the knotty and wormy ones should be rejected. The apples thus selected should be spread on a floor raised from the ground, with a cover over it, and the sides enclosed. Here they are to lie for the purpose of sweating, by which their more watry parts are thrown off. In this situation they should lie four or five days, when the weather is warm and dry, but longer when wet and cold. They should then be ground, and if the juice is left in the pomace from 12 to 24 hours, according to the heat of the weather, the cider will be the richer, softer and higher colored. It would be better, it has been said, that the fruit should be all of one kind, as the fermentation will be more regular. Mr. Deane directs that the juice of the fruit, as it comes from the press, should be placed in open headed casks or vats, there to remain until it undergoes the first fermentation. Such vessels are not, however, provided at our common cider-mills, but the juice is put into common casks. The vessels which receive the juice should be perfectly sweet and clean, or the juice will be reduced in its quality, if not spoiled. For cleansing casks, let them be washed perfectly clean after they are emptied of the old cider, and be bunged up tight. Before they are used again take at the rate of a pint or more of unslacked lime for a barrel, put it in, and pour in three or four gallons of hot water, or more, for a larger cask. Shake it well, and while the lime is slacking, give it some vent, lest it burst the cask. Let it stand till cooled, and then rinse it with cool water. If it still has any sour smell, repeat the operation till it smells perfectly sweet. The lime destroys all the acidity which may be in the cask.

The first and last running of the cheese is not so good as the rest, and should be put in the cask by itself. There should be a strainer of coarse cloth, when it can be had, instead of straw, that is generally used, on the bottom of the funnel, to keep out the pomace. The next process is the fermentation. There are three fermentations, the vinous, the acid, and the putrid. When the first ceases, the second begins; and when that ceases, the third begins. The first is only necessary for cider; and care should be taken to stop all further fermentation as soon as this is over. This is known by the liquor ceasing to throw up little bubbles to the top; then too, all the pomace is raised up, and if suffered to remain there, will again sink to the bottom, and render the liquor turbid. At this time the barrel is usually bunged up, when cider is intended for common use. But for the best cider, the liquor should then be drawn off, not too closely, and put into other clean casks, or bottled and closed tight, and set away in a cool cellar.

While the fermentation is going on, the cask should be filled quite full with similar juice, that the pomace which rises to the top may be thrown off, and not permitted to sink to the bottom after the fermentation ceases; this, however, is not necessary, when the cider is to be drawn off into other casks, as above directed.

"To prevent the fermentation of cider, let the cask be first strongly fumigated with burnt sulphur, then put in some of the cider, burn more sulphur in the cask, stop it tight, and shake the whole up together; fill the cask, bung it tight, and put it away in a cool cellar."

To refine cider, and give it a fine amber color, the following method is much approved of; take the whites of six eggs, with a handful of fine beach sand, washed clean; stir them well together; then boil a quart of molasses down to a candy, and cool it by pouring in cider, and put this, together with the eggs and sand into a barrel of cider, and mix the whole together. When it is thus managed, it will keep for many years. A piece of fresh bloody meat put into the cask, will also refine the cider, and serve for it to feed on.

A dozen of sweet apples, sliced into a cask of cider, have been found advantageous. Three quarts of good wheat, boiled and hulled, put into each hogshead, it is said, improves the liquor, and prevents it becoming tart.

To clarify cider with isinglass, pour into each vessel about a pint of the infusion of about sixty grains of the most transparent of this glue, in a little white wine, (any common sour wine, or well wrought cider, perhaps will do as well) and rain or river water, stirred well together, after being strained through a lincloth. This viscid substance spreads over the surface of the liquor, and carries all the dregs with it to the bottom.

"A quart of honey, or molasses, and a quart of brandy or other spirits, added to a barrel of cider, will improve the liquor very much, and will restore that which has become too flat and insipid."

To prevent its becoming pricked, or to cure it when it is so, put a little pearl-ashes, or other mild alkali into the cask. "A lump of chalk, broken in pieces, and thrown in, is also good."

The usual practice of boiling cider in the spring for summer use, is said in the Farmer's Assistant, to be a very bad one, especially when boiled in brass kettles; and, that if any boiling be ever proper for cider, it should be as it comes from the press.

"To cure oily cider, take one ounce of salt of tartar, and two and a half of sweet spirit of nitre, in a gallon of milk, for a hogshead. To cure ropy cider, take six pounds of powdered

allum, and stir it into a hogshead; then rock it and clarify it.

To bring on a fermentation, the same author directs, to take three pints of yeast for a hogshead, add as much jallop as will lie on a sixpence, mix them well with some of the cider, beat the mass up till it is frothy, then pour it into the cask, and stir it up well. Keep the vessel full, and the bung open, for the froth and foul stuff to work out. In about fifteen days the froth will be clean and white; then to stop the fermentation, rack the cider off into a clean vessel; add two gallons of brandy, or well rectified whiskey to it, and bung it up. Let the cask be full, and keep the vent hole open for a day or two. By this process, cider that is poor and ill tasted, may be much improved. Let it be refined by some of the methods before described.

Cider brandy mixed with an equal quantity of honey, or clarified sugar, is much recommended by some, for improving common cider; so that, when refined, it may be made as strong and as pleasant as the most of wines. It is not to be supposed that all the methods recommended for making and improving the quality of cider are expedient, or even practicable, for the greater number of the cider making farmers of our country, by whom it may be urged, that cider made and prepared in the common methods, may answer the necessary purposes of this liquor; but it may be observed, that cider, when made only for family use, is much more likely to constitute to health, or at least, not to injure health, when it is so managed that its constituents are made up of nothing but the pure ripe juice of the apple, perfectly clarified in the process of fermentation, from every substance which may be in any manner deleterious to the human constitution. This should be one great object in improving this valuable liquor, that we may prepare it for use, unadulterated with any unripe or decayed juices, or other substances, which may be either offensive to the taste, or injurious to the health. This indeed is a sufficient object, to induce the farmer to make improvements on the usual methods of making and preserving cider, for his own use. But if money is his object, it is very certain, that the market price of his cider, will depend on its good or bad qualities. Cider has been made in Great-Britain of such a superior quality, as to command a price of sixty guineas a hogshead. If such cider can be made there, it may also here, where our climate is believed to be more favorable for the production of the best apples, and we have all the means and the information, necessary for making the best cider.

The apple called the Virginia crab, has been thought preferable to any other in this country, for cider; as its must* is less

* Must—a word more commonly used to signify new wine, or wort for beer, is here applied to the unfermented juice of apples.

disposed, from its great acidity to rise too high in fermentation, than any other known here. Were there no other advantages, this simple one, it is said, would render it exceedingly valuable to the common farmer, who will be hardly brought to pay attention to the nice operation of fermenting the sweeter fruits, but it has almost every other good property of a cider apple. The trees bear abundantly, the fruit ripens late, and is free from rot of any kind; the fruit is small and hard, and therefore bears the fall from the tree without bruising. It grinds small, and the pulp is remarkably tough; yet parts with its juice readily; hence the must runs from the press very fine, and being acid, it will bear to stand in the pomace longer than any sweeter apple. This fact deserves much attention. It would, therefore, be well to preserve those apples for the best cider, which have qualities similar to the crab apple.

As good cider cannot be expected without proper attention to its fermentation, the following principles should be regarded: "Cider requires a very gentle fermentation, and ought to be confined between 44 and 48 degree's of heat, (by Fahrenheit's thermometer). Musts, of all kinds, increase their heat by fermentation. Liquors, of all kinds, will not be colder than the air in which they stand. It is obvious then, that it is difficult, if not impossible, to make good cider, when the medium heat of the day exceeds 48 degrees; and it is said that because our best cellars are 50 degrees of heat in the latter end of October, they are generally unfit for fermenting cider; and that, therefore, there is a necessity of having your first fermentation above ground, where the heat of the day will have its effect. Hence the known fact, that cider ferments most kindly in the shade on the north side of your buildings, whenever the cool nights of the fall reduce the medium heat of the day below 48 degrees.* Early made cider intended for immediate use, should be checked in its fermentation, from time to time, and it is said by that means, it will soon become fine, and a very pleasant drink.

* It is not supposed that the common practical farmer can always direct his process by the degrees of heat indicated by the thermometer. But the immediate and rapid progress of the fermentation of the juice, after it comes from the press, is a sufficient indication of too great a degree of heat.

ECONOMY OF MANAGING WOOD LAND, SO AS TO MAKE DURABLE PROVISION FOR FUEL.

The practice of the populous nations of Europe, where forests have been cut off centuries ago, and who are compelled to resort to measures of the strictest economy to supply themselves with fuel, ought to have great weight with us. France in an especial manner, ought to be looked up to for lessons on this subject. Her vast and thickly settled population, her numerous manufactures, her poverty in mineral coal, the eminence which she has attained in all economical arts, entitle her to great respect. It is the practice of the French people not to cut off their woods oftener than once in twenty or twenty-five years, and by law, when they are cut over, the owner is obliged to cut the whole smooth, with the exception of a very few trees which the officers of the government had marked to be spared for longer growth. This example proves that in the opinion of the French scientific and political men, it is expedient, where wood lands are cut, that they should be cut smooth, in order that the new growth might start together, not overshadowed with other trees of larger growth."* It has been said too, that the practical economists of that country are of the opinion that the young sprouts will spring and grow more rapidly, from the roots of trees which are cut in the full vigor of their early growth, before they have arrived even very near to their maturity; and that therefore the greatest quantity of wood for fuel may be produced from a given quantity of land, by cutting the trees smooth and clean at about their middle size, and the land inclosed, so as to keep off all animals which may injure the growth of the young sprouts. By the system of management which now prevails, (in France) it is computed that their forests and the supplies which they furnish, will never diminish, and that there will be always sufficient for domestic consumption for fuel, as well as for architectural and naval purposes.†

France, it appears, is the only country in Europe, if not in the world, which has been so long improved with a crowded population, where fuel is so plenty and cheap, and it is obviously to be attributed to their peculiar system of managing their wood lands, which is entirely different from that which has generally hitherto prevailed in the United States of America.

Here the first object in making new settlements, is to clear

* New England Farmer, title wood land p. 518.

† M. Micour, on the forest trees of North America.

as much of the land of its forest trees as is practicable, and as soon as the roots are sufficiently decayed to admit of cultivation, to plough and sow and reap, till the rich vegetable mould is exhausted; and then instead of adopting such a mode of cultivation as may perpetuate its fertility, they fly to new forests for relief.

By this means, too great a portion of our lands are cleared of their trees, while vast tracts of those which are called improved, often present to our view a miserable barren waste.

The next error is that of running over the old forests that remain, to pick out the few scattered trees in a state of decay. By this means it is believed, the saving of such trees will not generally compensate for the loss which is sustained by the injury to young sprouts, and by the loss of the more rapid growth of the sprouts, which the roots of the trees might produce when left unshaded and undisturbed, according to the system adopted in France. This practice of running over every part of the forest to pick out the decaying and dead trees, may be justifiable where bad economy and other circumstances has, so far reduced the number of forest trees; as to render the entire consumption of the present growth indispensable, sooner than fuel can be expected from the new growth. Such a state of our wood lands, however, can hardly be conceived, and even under any circumstances it would be difficult to show that a more durable and abundant growth of forest trees for fuel might not be expected from the wood lands throughout the United States, by cutting them smooth and clean, especially clearing off all trees which have arrived to any considerable degree of maturity; reserving occasionally a few scattering ones which might be wanted for timber.

The farmer who would appropriate but a small portion of his lands to forest, might find it for his interest to have a small spot of ground set apart for the purposes of an artificial forest.

The locust is a very valuable tree to cultivate either for fuel or other purposes. It is said this tree will grow well on barren sandy land, and indeed on every kind of dry soil where the climate is not too cold; though a sandy loam or gravelly loam is best suited for it. The trees will acquire a considerable size in fifteen years, and in about twenty-five years are full grown. The timber is very good for the trunions and knees of vessels, for cogs for mills and many other purposes, which require solidity and durability. It will last from fifty to sixty years for fence posts, and is excellent for fuel.

The following is an easy method of raising it. Plant about twenty trees on an acre; and when they have got to be about twelve feet high, and their roots well extended, run straggling

furrows through the ground, and whenever the roots are cut by the plough, new trees will start up, & stock the whole ground with a plentiful growth. This tree has been but lately introduced into general use in France; and it is there valued more than any other in that country.

The Lombardy poplar grows very rapidly, and is easily raised from cuttings, and when dried, answers well for fuel. It is cultivated extensively for that purpose in some parts of Europe, and has been introduced into some parts of our own country for that purpose. It acquires its full size in about twenty years, by which time it has been said a tree will contain about half a cord of wood; it is believed it will contain more. It will not make wood equal in quality to locust; but as it grows more rapidly, its inferiority may be compensated from that circumstance. In France and Italy it is trimmed up for beams and other timber for building.

In most parts of the United States of America, wood for fuel and timber is yet plenty, and bears but a moderate price, except in the vicinity of our large towns and cities, and it may always be preserved so as to supply all the necessary purposes of our citizens, if we practice that system of economy which has so much distinguished the policy of France. But we must change the conduct which has marked the progress of our new settlements generally. Instead of running over so much of our new forests, and exhausting the strong vegetable mould which has been accumulating for ages, we must bestow more labor in making durable improvements on such as are cleared; and in bringing our waste and barren land to as high a degree of productiveness as they will bear. Farmers with large tracts of land half cultivated, and which yield little more than the value of the labor bestowed upon them, as is too often the case in many parts of our country, are but poor; and their condition is not much better than those who earn their bread by their daily labor. In our older settlements, if our forests were made extensive, and our improved lands more highly cultivated it would promise to our future generations more durable blessings.

The following observations respecting the economy of using fuel is worthy of consideration.

It is well known to philosophers that when water commences boiling in the open air, no additional fire can make it any hotter. A contrary opinion prevails, & those employed in cooking victuals think they cannot make the fire too intense. The fuel added for this purpose is, in fact not only a wanton waste, but by causing a violent ebullition it forces from the victuals,

with the steam its finest flavor. Much fuel might therefore be saved in families, if in cooking no more fuel were used than to keep the water just at the boiling point, besides the victuals would be much better for it.

FENCES.

To fence a farm in the most economical manner, and at the same time the most secure and durable, is an object of great consideration to the farmer. While timber is plenty, but little is often thought of the necessity of economy in this branch of farming. But however great the supply of fencing timber may be, or of stone suitable for wall, the labor necessary for furnishing the materials at the places where they may be needed, for erecting the fence and keeping it in repair, constitutes the greatest item of expense, which relates to this branch of farming. It has, therefore, been considered an important object in older countries, and some parts of our own, to substitute some kind of fence which might be more durable, and at the same time perhaps not more expensive than any kind of wooden fence, other than such as are made to grow around the field to be inclosed. For this purpose, hedges have been raised, composed of different kinds of shrubs, in some parts of New-England and the middle States. It has been found that the white mulberry answers well for this purpose, and is recommended as having the peculiar advantage of affording food for silk-worms, which may be either raised on the hedges, or the leaves may be gathered to feed them. For making white mulberry hedges, Mr. De La Bigane directs that the plants, when set, should have a year's growth, and be cut off about six inches above ground, that their roots be taken off, and that they be set five inches apart and eighteen inches deep in a ditch dug for the purpose, and the earth thrown in upon them again. This depth has been thought too great, and the distances between them too small, unless they are to be afterwards thinned as they grow larger. He also directs that the shoots be cut off the following spring, a little above ground, in order that they acquire more strength, and shoot forth more branches; and then they will form a good fence the third or fourth year, and

soon grow so thick as to be totally impassable by any cattle. He further observes, that the branches must be twisted and woven together much earlier than those of thorn. The young plants, when set out, are to be kept clear of weeds, and protected from cattle. Mulberry hedges may be made from slips, or cuttings, taken from mulberry trees; and in that case, should be set as deep as has been recommended for sets. Mr. Nicholson, in his *Farmer's Assistant*, remarks, that the mulberry tree is well worth raising, not only for its fruit and use in feeding silk-worms, but also for its timber and for fuel, as it grows very rapidly, and is generally well adapted to our climate. He further observes that it grows well in a deep dry soil, that is moderately rich, and that it may be raised from the seeds, or by cuttings or slips. Taking into consideration its use for hedges and fuel, perhaps it might be a useful substitute for the Lombardy poplar.

When hedges are to inclose wet land, they should be set on the bank of a ditch, made around the field for that purpose.

The thorn, the apple, and the willow, are most used for the purposes of hedges. But it is said that the English thorn is apt to be killed by the winters, in the northern parts of New-England; and the same author says, that the difficulty in making the seeds of our own thorn vegetate, it is believed can be easily overcome, by their being put into hot water, or in muriatic acid gas mixed with water.* To raise the thorn from the seed, it should be sown in the fall, in a warm rich soil, and if it has a southern exposure it will be better, and at the depth of about two inches. After they have come up, they should be transplanted into other beds, and kept clear of weeds until they are set out in the hedge, which should be at the height of about two feet. Mr. Miller has directed that the sets of them, when planted out, be of the thickness of a common goose quill; that they be planted when newly taken up, with their tops cut off about six inches above ground; and that they be bedded in the richest mould dug out of the ditch. When two rows are set together, that each plant be put at the distance of about a foot, but when only one row is set they should stand closer. The same author observes, that they should be hoed and kept clean of weeds during summer, and after having one summer growth should be cut off early next spring, at the distance of about an inch from the ground, which will make them send out stronger shoots and help their growth. When the hedge is eight or nine years old, it should be slashed by cutting them half through

* See essay on the germination of plants.

and weaving them together, trimming off the superfluous branches, early in the spring.

Mr. L. Hommedieu says, that apple seeds in the pomace, strewed along and buried in the top of the banks of ditches made for hedges, and kept from the cattle until they have attained sufficient strength, will answer very well for this purpose: and as the cattle will be continually biting off the young shoots, it will make the hedge grow more bushy, thick, and strong.

Hedges, in dry land, may do well without ditches. Where no ditch is used, the hedge perhaps may be better set in two rows, about a foot apart. The young hedge should be protected from cattle. But to save the expense of making a fence for the purpose of protecting the young hedge, it would be best, when circumstances will admit, to commence the setting of the hedge around a field which is intended for such improvements as to exclude cattle the most of the time which may be necessary to raise the hedge above the reach of their ravages. Where, for instance, a rotation of crops is intended, of potatoes, pease, wheat, and clover, it will be no inconvenience to keep cattle from such a field a sufficient time for the hedge to arrive to maturity. If a hedge is intended around a moadow, cattle will not be likely to injure it, if they are turned in to feed only when there is plenty of grass.

One objection to hedges for fence is, that in a country so young as the United States, the system of improving particular tracts of land, is not so settled and matured, as to render it sufficiently certain what may be the permanent dimensions of particular inclosures, and where a durable fence may be expedient. But the better the science of agriculture is understood, the more practicable it will be to fix durable dimensions to certain fields. For it is very certain that the scientific farmer can so direct his labors as to render the same field permanently productive, and the culture of it profitable, without removing any part of the fence which incloses it.

Hedges are believed, by some who have used them, to be cheaper than any wooden fences. And when once they are made, it is certain they are more durable, and need but little repairs. It is believed, too, that they are a much better protection to crops than wooden fences, as they are usually made. They are insufficient only against hogs; and they should always be kept in inclosures made for the purpose.

Where the land is very wet, a ditch two feet or two and a half, and about two feet deep, with a steep bank, may answer well without a hedge on the top. But a small hedge, in such

places, would be preferable; and it is very easily made from the shrubby kind of willow that is found growing by the side of many of our streams.

For making the hedge of the willow, whether in the bank of the ditch, or any other suitable place, stakes of a proper length are to be cut and set a considerable depth in the ground, about a foot apart, and they will take root and grow, and new twigs will sprout out from every part and soon form them into a thick bushy hedge. This, when sufficiently grown, should be managed as other hedges. The sets may be two or two and a half feet long, when stuck for the hedge.

The willow hedge is very easily raised from sets or cuttings; which readily take root either in the spring or fall.

When land naturally wet, is situated by the highway, one pretty wide and deep ditch made on the line between the field and highway, with a hedge of willows on its bank, is preferable to any other fence, and should be commenced by our farmers as soon as practicable, as it would contribute to the double advantage of improving both the field and the road, by drawing off the excess of water, besides making a useful and durable fence.

If the farmer has rail timber in plenty, and prefers using it, he will find that posts set on the bank of the ditch, with not more than two rails inserted in them, will make a sufficient fence. The post to be set, would always be much more durable if the end of it to be set in the ground is burnt so as to make them black.

The farmer who would object to hedges for fence, because they cannot so soon become efficacious for the purpose, should reflect that it is the duty of the good citizen to direct his labors so as to make the most lasting improvement to his lands; and that we live as well for posterity as ourselves.

I have just now been favored with the perusal of Mr. Silliman's remarks on hedge rows, taken from his travels in England, and made on a personal view of them while in that country. They are, says he, the most perfect fence that can be imagined, being at once impervious to small animals, and impassable by large ones; incapable of being pulled up, overthrown, or disordered, and for many years needing no repairs; they also form a most beautiful feature in the scenery of the country, especially when they are filled up by flowers, which is more or less the fact very generally; the fields are a rich garment, and the hedge rows form the embroidered edge or border. In some instances the hedge rows are placed on mounds or dykes of earth, which in general would form a competent inclosure of

themselves ; especially as they are accompanied by ditches, out of which the earth which formed them had been taken. In many instances, and especially in the vicinity of gentlemen's houses, these mounds, or dykes, are sodded with great neatness, so that the verdure is as perfect as their almost perpendicular sides are in the field ; and when upon the top of these rural parapets, the fine hedge row rises, trimmed with perfect precision, and forming the most elegant green fringe, it is scarcely possible to imagine any thing of the kind more gratifying. Around some plantations, the mound and hedge row together, estimating from the bottom of the ditch, form a fence of ten or twelve feet in height.

The length of time, and attention to make hedges, or live fence, is a discouraging circumstance. The expense of trimming and keeping a live fence in order, is thought by some who have used them in this country, to exceed that of keeping an ordinary rail or board fence in repair. Should a very unruly animal break through a good live fence, or an evil disposed person cut their way through, a gap is left, which must be filled by a dead fence of some sort, until a new growth.

Notwithstanding the good properties of this kind of fence, it is not to be supposed that the farmer who has a plenty of thrifty growing timber, or a suitable quantity of loose stones within a reasonable distance, will undertake the cultivation of live fences. But there are farms, and even extensive tracts of land in our country, in which there are no stones suitable for walling : and where fencing timber too has become scarce. In such places live fences and ditches are the last and only resort. And when live fences have become indispensable, or are likely soon to become so, they ought to be set about before the old stock of fencing timber is gone entirely ; and by making a short piece every year, a knowledge of their usefulness may be acquired, as well as the manner of making and taking care of them.

A good fence may be made by running a ditch around the field, whether it be a dry or wet soil, and on the top of the mound which is raised by the excavations of the ditch, to set pickets of some durable timber, about three or four inches apart, the height of the pickets need only be about three feet above the top of the mound, and if it is four or five inches in diameter, it will be of sufficient strength to guard against ordinary animals of any description. Such a fence would, perhaps, require less timber than any other wooden fence.

TEAMS.

THE superior advantages of horses in teams, are their quickness of motion, and greater docility; and their disadvantages are, their greater expense in raising and keeping, and extra expense of harness, and being of no value, when their service is at an end. The advantages of oxen, are said to be their being less expensive in raising and keeping, and their value, after their time of service expires; and their disadvantages are, their slowness of motion, and their being less tractable.

The following calculations, respecting the relative value, utility of horse and ox teams, is worthy of consideration: "Say that a good span of farming horses are worth, at four years old, one hundred dollars: at fourteen years from that time, they are worth little or nothing; of course, another sum of one hundred dollars, at the expiration of that time, be expended in the purchase of a new span. This sum, laid out at the end of fourteen years, is about equal to fifty dollars paid down. In order, therefore, to keep the span, a capital of one hundred and fifty dollars, is necessary; which is equal to an expenditure of ten dollars and fifty cents a year. A yoke of oxen, at four years old, are worth, say sixty dollars; and allowing them not to depreciate in value, till turned off for fattening, they require an expenditure of four dollars and twenty cents a year, as the interest of the capital, laid out for them. Say that the horses will cost fifteen dollars a year more than the oxen, to keep them, and provide harness for them. Say also, that they do a hundred days work in a year, and that the oxen, working a quarter slower, require one hundred and thirty-three days to perform the same labor; then if one hand only, is employed with the oxen, his wages and board during the extra thirty-three days, at fifty cents per day, would still leave a balance in favor of the oxen, of four dollars and eighty cents, for the year's work; but if they should require a boy to drive, while another hand holds the plough, then the balance would be very considerable in favor of the horses.

Perhaps on smooth lands, and for carrying loads to market, at a distance, horses may be preferable. But oxen are certainly preferable for husbandry in many respects; they are cheaper than horses, as it regards their food, the method of keeping them, the superiority of their dung, their being subject to fewer diseases, and their suffering no loss of value by age. Two oxen in a plough require not a driver more than a span of horses. Lord Skaines says, that the Dutch, at the cape of Good Hope, plough with oxen, without a driver, and early exercise them to a quick pace,

so as to equal horses, both in the plough and in the waggon: that the people of Malabar use no other animal for the plough, nor for burdens; and that about Pondichery, no beasts of burden are to be seen but oxen. He further remarks, that if oxen were more generally used, the article of beef, candles, and leather, three essential necessities of life, would become much cheaper. In some parts of Great-Britain, they are used singly in carts, and two in a plough, with cords, without a driver. It has been observed by Mr. Livingston, of New-York, that if we may argue the utility of a practice, from its extent, we must prefer drawing by the horns, to any other mode; that nine tenths of Europe make their cattle draw in this way, and from what he had seen of this performance, he was persuaded it was to be preferred to the yoke. He observes, that a bull's strength appears to be placed in his neck, and in drawing in this way, the whole of it is exerted; his motion is not impeded, or his skin chafed, as it is by the yoke."

In the mountains of Savoy, he observes, he saw many cattle, chiefly cows,* drawing by the horns, not in carts, but in waggons. He observes, however, that our cows are in general much smaller than those usually worked in Europe. That although yokes are used in some parts of Italy, they differ from ours. Instead of bows, they have four flat pieces of wood which hang from each side of the yoke, and are about ten inches long, and hollowed so as to fit the sides of the neck, and so thick as to admit a rope or chain to pass through them, by which they are fixed to the yoke; and each pair of them are united by a chain or rope under the oxen's neck. The draft, in this case, he observes, is by the top of the shoulders only, and that he believes it is to be preferred to our bows on that account, because the bow, by pressing the shoulder blade, impedes the motion of the animal. For holding back, whether they draw by these yokes, or by the horns, the end of the whole projects considerably by the heads of the cattle, and teems up very much. To this is fixed a leather strap that goes round the horns of the oxen, so that they keep back the weight by the horns, and with much more ease than ours do by twisting their necks. In England they are worked in a harness, which were it not more expensive and more troublesome, it is said, ought to be preferred to the method practised here. The

* This practice, and many others, which the American farmer may be disposed to deride, though in some future period of our history, his circumstances may render it expedient to adopt from necessity, if from no other cause.

slowness of oxen, which is the greatest objection to their utility in husbandry, is doubtless owing in part to their weight and natural inactivity, and in part, too, by overloading them with burdens that are made to bear constantly and heavily upon their necks. But it appears that these causes are in some measure remedied in Europe, by different modes of draft, some of which have been described; and by exercising them to a quick pace. It has been said that the Sussex Oxen, in England, have beaten horses at the plough in the deepest clay. The Hartfordshire and Devonshire oxen there are recommended as the most speedy. It is well known that there is a great difference in our oxen with respect to their agility and docility, and it would be an object worthy of much attention for our farmers to seek for such ones for farm labor, that excel in those properties. Some oxen to be selected from our common stock may be found that will perform nearly double the labor on account of possessing these properties in a superior degree. When by experience and observation the farmer may discover a particular breed of cows whose bull calves are such generally as to make oxen possessing these peculiar properties, he would do well to keep and improve them for that purpose.

The choice of the most convenient carts for the purposes of husbandry, is a subject connected with that of teaming.

It is said that some of the best British farmers generally use one horse carts instead of wagons on their farms; and they are particularly recommended by Mr. Young, for this purpose, as being on the whole more convenient and cheaper. In Ireland, the wheel car, as it is called, is almost universally used on farms, and for transporting on the highways. Each horse in that carriage, draws from ten to twenty hundred weight, according to the state of the roads; and it is said there that one animal drawing by itself, in a car or cart, can as easily draw eight hundred weight, as two can draw twelve hundred, when put together in a waggon. The reason assigned is, that in a cart the horse carries a part of the load on his back; and in drawing, his exertions are not baffled by the jostling and unequal exertions of another. It is objected against carts, that they press too heavily on the horse, or oxen, when going down hill, particularly when carrying a top-heavy load, and that they will incline to tilt up, when going up hill, with such load. These defects have, however, been in some degree obviated, by a contrivance fixed in front of the box, for the purpose of raising its fore end when going down hill, and of sinking it, when up, so that in either case, the centre of gravity of the load will not be materially altered, from what it is on level ground. In the

construction of the body of the cart, the essential points are to fit it for the purposes for which it is mostly to be used ; to place so much of it before the axletree, as that, when filled, about a fifth of the weight of its contents will rest on the horse ; and that it be so constructed as to be tilted up, to empty its load.

To those farmers in our country, who keep so many cattle, as always to have a sufficient number of both horses and oxen, for any purposes of husbandry, the introduction of the one horse cart, may be considered as an object of minor importance. But there are in our country, as in all other, a large class of the cultivators of the soil, who find it necessary to use much economy in the use of a team. In older countries, as well as in some parts of our own, this class of farmers have found the one horse cart to be one of the most useful implements of husbandry. I have been informed by a farmer, who made the study of agricultural economy an important object, that with a single horse and horse cart and other implements of tillage, he performed all the team work on his farm, which afforded him all the necessary produce for the support of his family, and that, with this team, he found it both convenient and profitable, to transport both his hay and fuel. The wagons in common use, are doubtless best, and indeed necessary, for those cultivators who pursue the business of farming on a large scale ; or who have occasion to carry produce, or other heavy articles any considerable distance ; though farmers of this description, would frequently find the common horse cart a very convenient and profitable vehicle for many purposes. It would therefore be a great improvement, in rural economy, to introduce the one horse cart into general use among the farmers ; experience will soon attest its numerous advantages. That class of cultivators particularly, who improve only a garden, or a few acres of land, will thereby save themselves from much expense, as well as the great delay and inconvenience, which must accrue from depending on farmers to perform for them the numerous services, which they might themselves perform with this cart and a single horse, and one too, which might be purchased for a small price, while he would possess all the properties necessary to carry into effect an economical and profitable plan of husbandry, on a small scale.

The following improvement in the harnessing of horses for the wagon, so as to do less injury to roads in travelling, has been suggested to the citizens of the State of New-York, by direction of the board of agriculture. Let the double whippetree and neck-yoke be so long that each horse may travel in a line directly forward of the wheels. Travelling in this manner,

it is said, would entirely prevent all ruts, as the horse's feet would beat down and level the small track of each preceding wagon; and in case some ruts or holes should begin to make their appearance, the horses, to avoid them, would immediately turn to the right or left, and the wheels of course would follow: the consequence of which, would be smooth, level, and durable roads, with half the expense for repairs which is now laid out upon them.

If the advantages which are suggested, will result from such a constructed harness as has been above described, the general use of them, especially on great market roads, ought to be introduced; as a partial use of them, would not effect the object.

The above remarks, respecting teams, are submitted to the consideration of the American farmer, without any farther comment than barely the suggestion that, they are the result of the observations and experience of practical farmers, in some parts of our own country, and in Europe, where every branch of husbandry has been gradually progressing in improvement, for five hundred, perhaps for one thousand years.

HORSES.

The raising a good breed of horses, is an object worthy of the attention of the American farmer.

The opinion that the value of the colt depends on the good properties of the horse, has by universal experience been proved to be incorrect. The laws which govern the generative powers in every animal, with which we are acquainted, evidently give to the female, its full share in characterizing the issue. Common observation confirms the truth of this fact. If farmers would secure a good breed of colts, they would be more likely to succeed in that business, if they would keep mares for that purpose which have such properties only as are essential to render a horse valuable; notwithstanding it may be expedient to preserve a stud which has valuable properties. But the only reliance which most farmers have upon the value and properties of the sire, too often disappoints their expectations, and subjects them to great expense, as the price of the

foal. It has often happened that the colts, begotten in a season, will hardly at the time of weaning pay for the use of their sire. The raising of a valuable breed of stud-horses should be encouraged; but the interest of the farmers would certainly be better promoted, in raising a valuable breed of horses, if they would make it an object to keep no mares for breeding, but such as possess the properties which constitute a valuable horse.

It has been usual to work breeding mares through the greatest part of the year, laying them aside only a week or two before foaling, and during the summer season, when giving suck to the young foal. By this means, the strength and vigor of the mother is not only weakened, but the size and powers of the foal are often diminished by the exertions of the mother, when kept at work. It is believed by some farmers, that from three months before foaling, until the colt is weaned at seven months old, the dam should not work.

The following method of weaning is preferable, when circumstances render it practicable. Suppose the colt about seven months old the first of January; put a halter on it, and tie it to the manger, by the side of the dam. Loosen it and let it suck two or three times each day, for about a week. Afterwards continue it tied by the side of the dam, watering it three times a day, by carrying water into the stable. Gradually teach it to drink milk, to eat bran mixed with water, potatoes, and other succulent food; and to give this kind of food, together with good hay, until grass time. It should always have a good dry bed to sleep on. The second winter it should be kept tenderly also, and well fed with potatoes, good hay, &c. but should eat no oats or corn, until it is at least three years old. A colt should never be allowed to be poor in flesh.

It is believed that the superiority of the English breed of horses, may be accounted for by the same reasons, which have in these essays been assigned for the extraordinary breeds of English neat cattle.*

It is probably owing in a great measure, if not principally, to the succulent and other food, more nutritive than dry hay, given to their horses through the winter, by means of which they keep them growing the whole time from the foal, till they arrive to the period assigned by nature, at which they attain the utmost size and maturity which their nature and constitution will admit. It is doubtless by this means, that the English

* See essay on Neat cattle.

breed of horses exceed the American more in size than in any other qualities which may be thought to enhance their value. If the Americans would improve their breed of horses, they had much better adopt the same means which they do in Great-Britain to improve theirs, than to pay the enormous tax for that purpose which they often do to the importers of stud horses from that country.

To make horses profitable, they should be kept well, and not worked beyond their strength. Grain is most efficacious when given to a horse either ground or boiled.

When horses by long journeys, or otherwise, have the skin rubbed off their backs, a little dry white led occasionally sprinkled over the raw flesh, will soon heal the horse.

Persons on journeys might well carry some of this article with them for this purpose. When the withers of the horse are wrung and swelled by means of bad saddles or otherwise, the swelling may be allayed by washing the part with brine and with salt and black soap mixed together, applied to the swelling. Any restraining, such as allum beat up with the white of eggs, is also said to be efficacious.

There has been a great diversity of opinion respecting the relative advantages of horses and oxen for the use of the farm; and it is of importance to farmers that they decide correctly in this particular.* The marks of a good horse are, a full breast, high neck, a strong black lively eye, stiff dock, full buttocks, ribs reaching near to the hips and good hoofs.

In first breaking a horse for the saddle or harness, when young, gentle means are better than the common method of forcibly breaking them. After he is broke to the halter, he should be tamed by leading him by the bridle with a saddle on his back, then by putting weights on the saddle, adding to them till he carries the full weight of a man. By making use of very forcible means, and that too without effectually subduing his spirit, his temper is sometimes forever after spoiled.

The usefulness and even the value of a horse often depends on proper breaking and careful usage when young.

A horse should never be exercised so severely, as to make him sweat profusely; but if he does, he should be covered, if the weather is cold, until his skin and hair be dried; and in the mean time thoroughly rubbed down. He should at all times be kept clean and well curried.

It is said to be profitable to give something to a horse when feeding on dry hay, to supply the want of saliva, which is

* See essay on teams.

thereby absorbed. Snow set before a horse for this purpose, is recommended; or some may be thrown into the manger. The experiment is worth trying.

DISEASES. HEAVES.—The symptoms of this disorder are well known. In early stages of the disease, the following medicine has proved efficacious in the cure of several cases of obstinate heaves: Take one pound and a half of good ginger for a horse, give two table spoonfulls a day, one in the morning and the other in the evening, mixt with wheat bran.

FILM OVER THE EYES.—Take a little clean hog's lard on one end of your finger, rub it well in the quadrupid's eye, once a day, for three or four days in succession, and it is said the film will be removed effectually.

COLIC OR GRIPES.—When occasioned by wind the horse is often lying down and suddenly rising again with a spring, and strikes his belly with his hind feet; stamps with his fore feet; refuses food; stretches out his limbs; his ears and feet are alternately hot and cold; falls into profuse sweats and then into cold damps: and often tries to stool, but cannot. This proceeds from a stoppage of urine, by a load of dung pressing on the neck of the bladder which should be removed with a hand dipt in oil. The following ball should be given as soon as possible: Take Venice turpentine, and Juniper berries pounded, of each one ounce, nitre, one ounce, oil of juniper one drachm, salt of tartar two drachms: make into a ball with honey or molasses: wash down with a horn or two of warm gruel. The following drink has proved an effectual cure. Take one ounce of juniper berries powdered, one ounce of anniseeds, half a gill of spirits of turpentine, and half a gill of liquid landanum: mixed in three half pints of warm ale and sweetened with molasses: at the same time give warm opening clysters. If this does not give relief in an hour or two, walk or trot the horse about gently, but not to jade him. Another species of colic, is termed billious or inflammatory, and is attended with most of the preceding symptoms. But a high fever soon comes on with a panting and dryness of the mouth; the horse continues to throw out a little hot dung, which appears blackish, or of a red color, and is of a foetid smell, this denotes an approaching mortification. In this case the horse should be immediately bled, as much as three or four quarts: and it should be repeated in three or four hours, if the symptoms do not abate; emolient cluster should be given, with two ounces of nitre dissolved in it, two or three times a day. The following cooling drink should be given every two or three hours, till several stools are produced; afterwards to be

only given night and morning : Take of senna, three ounces, salt of tartar half an ounce, infuse in a quart of boiling water : in an hour or two add four ounces of glauher salts, with two ounces of honey. If the symptoms do not abate, the only thing to be depended on is a strong decoction of jusuitsbark, given to the quantity of a pint every three hours, with half a pint of port wine.—*Carver*.

BOT WORMS.—This insect often proves very fatal to horses, and is produced by an insect somewhat resembling a bee in its head and neck, which in the summer months is almost constantly flying about horses, and in the course of a few weeks will fill their hair, particularly about the breast and legs, with a great number of its nits. It is an easy matter to scrape the nits off from the horse, about once a week, in the months of September and October ; and a horse that is so served, it is believed, will never be troubled with the bots. If the lips or tongue of the horse, covered with warm silva, come in contact with the nit, the bot immediately leaves the nit and adheres to the tongue, and is swallowed with the food of the horse. It is often difficult, sometimes impossible, to dislodge the bots from the bowels of the horse, or to compel them to loose their hold from the maw. It is therefore important to take much pains to prevent their being taken into the stomach, by the means above prescribed. Whenever a horse itches in any part, he applies his teeth for the purpose of scratching ; in doing this he loosens some of the nits, and they are received into his mouth, from whence they pass with his food into the stomach, and from these the bot is produced. To kill bots in a horse, pour a quart of rum down his throat : this will make them loose their hold of the maw, and they will be carried off with its contents. Repeat the dose as often as may be found necessary. A few doses of linseed oil, about a pint each time, will also quickly effect a cure. When these cannot be procured in season, a table spoonful of the powder of the blue flagg root, in a fresh state, given to a horse, will frequently expel a great number of the bots from his bowels. If the nits of a horse are scraped off about once a week, in the months of September and October, it is said a horse will never be troubled with the bots. Every attention necessary to dislodge the nits, from the horse, and thereby prevent the disease, should be attended to : for it is often very difficult and sometimes impossible with any medicine to dislodge the bot from the maw of the bowel.

FALSE QUARTER, is a cleft or chink in the hoof of a horse from top to bottom. The inner side of the hoof being the thinnest is most liable to it. When it becomes troublesome to a

horse, Gibson directs, that the cleft be paired out to the quick, then annoint the hoof with a mixture of tar, honey and suet melted together, and lay a pledget dipt in the same along the cleft. Then bind up the hoof as tight as possible, by winding rope yarn closely around it from top to bottom. The shoe should previously be taken off. The wound should be opened and drest every third or fourth day, and to prevent any inconvenience from this, let the cleft be held together at the bottom by a thin plate fastened on for that purpose. It is however very difficult, and often impossible, says the same author, to effect a cure in an old and a diseased horse.

FARCY is a disease in horses similar to the scurvy among men, and is caused by confining a horse too long to dry meal. It is known by small tumors appearing on the head and other parts of the body. Turning a horse to fresh pastures will effect a cure in the first stages of the disorder; but when it has become more inveterate by long standing, Gibson directs that the horse be bled, moderately purged, and then that doses of antimony be given him.

FOUNDERING OF HORSES.—It is usually said that a horse is foundered, when his feet and legs have become stiffened and sore, by eating too large a quantity of hard grain at once. The best remedy for this has been found to be exercise by riding; and in addition to this, also, put into a rag human ordure and wind round the bits, and let him chew upon it while riding him, and in due season repeat the dose, if necessary.

There is a disorder of the feet of horses, in which they are also said to be foundered. This is a painful disease; the horse, affected with it, draws himself up in a heap, and is loth to move. It is occasioned by standing in cold water, after being heated with exercise, or sometimes even by standing still in the stable several days after exercise; sometimes by bad shoeing, or by bruises on the legs.

In this case, if a remedy be not immediately applied, a gathering will take place in the feet, and the hoofs will be cast off; by which the use of the horse will be lost for some time. The remedy is, to slit the hoofs open from top to bottom, so that blood will follow pretty freely. In order to cure these wounds again, apply tar, turpentine, and honey, melted together, with a fourth part of the spirits of wine; let pledgets, made of tow, be soaked in this, and then laid in the chinks of the foot bound up. These are not to be opened for two days; and then let fresh applications be made every day till the channels in the hoofs be grown up.

If the sole of the foot is also drawn, it must be served in a

similar manner. A piece of leather should be laid over the sole, and the whole foot so bound up with strong bandages that the applications may not be displaced.

GIGS; little tumors, or bladders, filled with matter, found in the mouths of horses. The cure is effected by slitting them open, and then washing them with salt and vinegar.

GLANDERS; usually called the horse distemper. It is always accompanied with a discharge of matter from the nostrils, and a swelling of the glands under the throat and tongue. When the bones in that part become carious, it is generally incurable; and this may be known by the bad smell which is produced in such cases. Gibson, in his treatise on farriery, for this disease, while in its first stages, recommends, to make use of purges, diaphoreticks, and rowelling in the hinder parts. Rowelling in the breast is thought will answer the same purpose.

A disease of the nature of a cholic, with horses, and with which also horned cattle are sometimes troubled. It generally proceeds from wind pent up in the stomach, or bowels, and is caused by a high state of costiveness. Horses have been known to have the dung within them so hard and dry, that it could not be voided without assistance by clearing it out by the hand. After it has in this way been cleared out, clysters are to be administered, which will open the passage, and of course give vent to the wind.

HYDE-BOUND. This often happens when horses are poorly kept, and badly used. In this the animal grows poor, his skin sticks to his ribs, and small boils break out on his back. A method of treatment opposite to that which the horse has received, will generally restore him; that is, keep and feed him well, work him moderately, and loosen his skin by oiling it, and using the curry-comb frequently, but not too harshly.

LAMPAS. These are vulgarly called lampers. It is an excrescence in the roof of the mouth of a horse, which hinders him from feeding. Young horses are most liable to it. It is cured by applying a hot iron, made for the purpose, to the swollen parts. Care must be taken not to penetrate so deep as to scale the bone that lies under the upper bands of the mouth, for this would be very injurious.

POLL-EVIL. This is an impost tumor on the poll of a horse. At first it requires no other method of cure than is proper for boils and inflamed tumors; but it sometimes, from neglect or mismanagement, becomes a sinuous ulcer. In that case, the matter is apt to lodge in a small sinus which is under the poll bone, unless care be taken to keep the part firm with a band.

age; that if the tumor has a large cavity, it should be laid open, and if it acquires an ulcerous disposition, it should be treated as such.

TUMORS. When these appear on the poll, withers, under the jaws, or in the groins of horses, they should be forwarded by ripening poultices of oat-meal, boiled soft in milk, mixed with oil and lard, and applied twice a day, till the matter is perceived to grow soft, and moves under the fingers; and then it should be let out by a sufficiently large opening with the lancet. Let the opening be full as far as the matter extends. After cleansing the sore, apply pledgets of tow, spread with a salve, or ointment, made of Venice turpentine, beeswax, oil of olives, and yellow rosin; and let these be administered twice a day, if the discharge is great, till a proper digestion takes place, when it should be changed for pledgets spread with the red precipitate ointment, applied in the same manner. Should the sore not digest, but run a thin water, foment it as often as you dress it, and apply over this dressing, a strong beer poultice, and continue this till the matter grows thick, and the sore florid. Should any proud flesh get into the sore, wash it as often as you dress it, with a solution of blue vitriol in water, or sprinkle it with burnt allum and precipitate. If these should not prove sufficiently powerful, apply caustics, by washing it with a solution of half an ounce of corrosive sublimate in a pint of water. When the sore can be tightly compressed with a bandage, however, these funguses may be generally prevented.

Tumors caused by bruises, should, if necessary, be bathed with hot vinegar and verjuice; and then a flannel cloth should be wrapped round the part, if it can be done. If this does not abate the swelling, especially if it be in either of the legs, poultice it twice a day, after bathing it with wine lees, or beer grounds and oat meal, or with vinegar, oil, and oat meal, till the swelling abates; when, in order to disperse it entirely, let it be bathed twice a day with a mixture of two ounces of crude sal ammoniac in a quart of chamber-lie, having rags dipped in it and laid on.

When the extravasated blood is not dispersed by these means, let an opening be made in the skin, and let the blood out, and then heal the wound.

SCRATCHES, is a disease in the legs of horses, occasioned by bad blood and too hard labor. The skin of the legs becomes cracked open, emitting a reddish colored humor. To cure the disease, wash the cracks with soap suds, and then rub them

twice a day with an ointment of hog's lard, mixed with a little sublimate mercury.

SPAVIN ; a swelling about the joints of horses, causing lameness. There are two kinds of this disorder, a blood spavin and a bag spavin. The former is a swelling of the vein that runs along the inside of the middle joint of the hind legs, which is frequently attended with a lameness of the joint. To cure it, says Mr. Gibson, apply restringents and a bandage tightly drawn round the joint ; for then, if early applied, it will generally effect a cure : but if by these means the vein is not reduced to its usual dimensions, the skin should be opened, and the vein tied with a crooked needle and a wax thread, passed underneath, above, and below the swelling, and the turged part will then digest away with the ligatures. Let the wound be daily dressed with a mixture of turpentine, honey, and spirit of wine.

The bag spavin is merely a cyst, or bag, filled with the gelatinous matter of the joint, erupted from its proper place. To cure this, cut into the bag and let the matter discharge ; then dress the sore with lint dipped in oil of turpentine, putting into it once in three or four days, a powder made of calcined vitriol, allum, and bole. By this method of dressing, the bag will come away, and a cure will be effected without any visible scar. Should this fail of a cure, the hot iron is directed to be applied ; and in that case if the joint becomes inflamed, apply a poultice over the dressings, till the swelling is reduced.

STAGGERS. When this disease is occasioned by hard usage, Gibson directs to take a pint of blood from his neck, and then a quart from some vein in his hinder parts, and that he be kept on moderate cleansing diet.

When the disease arises from an apoplectic disorder, he must be treated as before, and exercising every day with chewing assafoetida, savin, and other noisome medicine, which will keep him in constant action, and forward the circulation of the blood in the small vessels ; afterwards recourse must be had to clysters, strong purgatives, rubbing, and exercise.

When it arises from the swimming of the head, the animal reels, turns around and falls. For this take an ounce of senna, boiled in five pints of water with four ounces of common treacle, and the usual quantity of oils or lard, to throw on as a clyster, and repeat this for two or three days ; after this he may have a drink of beer, in which the roots of peony, angelica, rue, rosemary, and flowers of lavender, have been steeped. If the disease continues obstinate, balls of cinnibar and assafoetida, with bog berries, will be proper : here, as in apoplectic cases,

Gibson condemns the practice of putting ginger and other stimulating things into the ear, as dangerous, though it may sometimes prove beneficial.

STRAIN, or SPRAIN. Horses are liable to strains, particularly in the shoulders. Anointing them with spirits of turpentine in the part injured, will help them for a while, but will not afford them a permanent relief. Washing the shoulder, when that part is affected, with brine, as warm as it can well be borne, will effect a cure in a few days. It should be done twice a day. And letting the animal rest from labor, will generally perform a cure in a few weeks, at farthest. If these will not answer, let warm poultices be applied, of bran boiled in vinegar, with a sufficiency of hog's-lard to prevent its growing hard; let this be repeated, if necessary, until the cure is completed; and then mind to keep that part covered a while so that it shall not be affected by colds.

WHEEZING. A disease of horses commonly called broken wind. Caused by surfeits, violent exercise when the belly is full, by being rode into cold water when very warm, or by obstinate colds not cured. For the cure, it is advised that the horse should have good nourishment, much grain, and little hay; and that the water given him to drink daily, have a solution of half an ounce of saltpetre, and two drachms of sal ammoniac. It is said that the hay made of white weed, or what is called bull's eye, may-weed, &c. will cure this disorder.

WINDGALL These are flatulent swellings on the bodies of horses, but most commonly they are seated on both sides of the back sinew, above the fet-locks. Sometimes they are in the joints and tendons. They are generally filled with air and a watry matter. When they appear in the interstices of the large muscles, which then appear blown up like bladders, they are principally filled with air, and may be safely opened and treated as a common wound. When they first appear, they are usually cured with restringents and bandages, drawn very tightly round them; for which purpose, let the swelling be bathed twice a day with vinegar or verjuice, or fomented with a decoction of oak bark, from granite and allum boiled in verjuice, and let the bandage which binds the wind-gall be soaked in the same. If this should fail, the swelling may be drawn off by blistering, and applying the blistering ointment, repeating it at times, till the humor is all drawn off. Some, however, cut open these swellings, wherever they may be situated, and treat them as a wound. But perhaps, when they are in the joints, the blistering is the safer remedy, as the joints may be stiffened by imprudent management.

YELLOW. In cattle, this disease is called the overflowing of the gall; in horses it is called the yellows, or jaundice. This disease is known by the yellowness of the eyes, and of the inside of the mouth; the animal becomes dull and refuses to eat. His urine is voided with difficulty, and looks red like blood, after it has lain sometime: the off side of the belly is sometimes hard and distended. First bleed plentifully, and give the lasative clyster, as horses having this disorder are usually costive, and the next day give him a purge of an ounce and a half of cream of tartar, half an ounce of castile soap, and ten drachms of saccobine aloes. Repeat this two or three times, giving intermediately the following balls and drink: Take ethiop mineral, half an ounce; mellepedes, the same quantity; castile soap, one ounce; make this into a ball, and give one every day, and wash it down with a pint of this decoction: Take madder root and tumerick, of each four ounces; burdock root sliced, half a pound; monks rhubarb, four ounces; boil the whole in a gallon of forge water down to three quarts; strain it off and sweeten it with honey. Balls of castile soap and tumerick may also be given for this purpose, three or four ounces a day, and will in most cases succeed in effecting a cure. By these means the disorder generally abates in a week, which may be seen in the alteration of the horse's eyes and mouth; but the medicine must be continued till the yellowness is removed. Should the disorder prove obstinate, more potent medicine must be tried; viz. mercurial physic, repeated two or three times at proper intervals, and then the following balls: Take salt of tartar, two ounces; cenabar of antimony, four ounces; live mellepedes, and filings of steel, of each four ounces; castile soap, half a pound; make them into balls of the size of hen's eggs, and give one of them night and morning, with a pint of the above drink. On the recovery of the horse, give him two or three mild purges; and if he be full and fat, put in a rowel.

There are some other diseases incident to horses, which must not be noticed in this short treatise; and perhaps it is not necessary, when it is considered that good keeping and proper management is almost a general antidote against all diseases.

NEAT CATTLE.

THE neat cattle in the United States, are evidently mixtures of various breeds, from different stocks, which have, in their origin, distinct and specific characters. This mixture has not probably diminished the aggregate value of the stock.

The distinct breeds as they are known in Great-Britain, will not generally be distinguished in our country by distinct and peculiar characteristics, until they are made so by the observations and practice of our farmers, in keeping them which have peculiar properties from intermixing with others possessing different properties.

The cattle, in Great Britain, which are called by particular names, as the Devonshire, the Lancashire, &c. originated from a stock possessing some peculiar valuable properties, for which they were originally distinguished. But it is by no means certain that the cattle, which may be called by those particular names in this country, possess their original valuable properties. These names are indeed convenient to distinguish a particular breed. But they are made use of doubtless, in market, very often, for the purposes of speculation and fraud. Names furnish no more evidence of peculiar valuable qualifications among cattle, than they do among political sects.

Our citizens, therefore, who purchase cattle for the purpose of improving the breed, should be careful to see that they do possess the qualities for which they are characterized, rather than rely on names as evidence of those properties.

Those who go into Great-Britain themselves, for the purpose of making purchases to improve our breed, are perhaps not so likely to be imposed upon by names, as our citizens are, who purchase here, without any historical knowledge of the origin of those cattle which are imported.

But if there is no fraud practiced in the sale of imported cattle, still it is believed our breed of cattle may be sufficiently improved for every valuable purpose, at much less expense than by importing them.

There can be no doubt but that among our mongrel breed of cattle, all the properties may be found, which distinguish the various breeds in Great-Britain; and as breeds of cattle are usually much improved by crossing or mixing different kinds together, we have no reason to believe that these properties are diminished in value, or that, on the whole, the stock is degenerated.

But very few of our citizens have capital sufficient; and very

few of those who have, are disposed to attempt to improve our breed by importing stock from any other country.

Those few which are imported, do not come to the possession, or even to the knowledge of but few of our citizens, until their blood becomes variously intermixed.

A particular account of the various breeds of cattle, which are known in Great-Britain by distinct names, can be of no other use to our farmers generally, than to convince them, in the first place, that our stock of neat cattle possess, in the aggregate of their various properties, all those which distinguish the stock of the English farmers, and to aid them in the object of selecting those cows for breeders, which possess those peculiar properties which are best adapted for those uses for which they may be wanted.

In the selection and improvement of our breeds of cattle, regard is to be had to the uses for which they are intended. If the best milch cows are desired, we should select from the breeds which are known to be the best for that use, and so with respect to others. I have made these remarks to explain my views, in describing the various breeds of cattle, known in Great-Britain at this time, a concise account of which is here given.

1. The original or wild race of that country, color invariably white; horns tipped with black; end of the ears, inside and outside reddish; black muggels; flesh fine, and well tasted.

2. The Devonshire breed, said to be in part descended from the above race; color, light red, with a light dim ring round the eye; thin face; thin skin; hips wide; tail quite low; rather small horned; horns turning upward; the cows yield good rich milk; oxen good for draught, and fatten early.

3. Dutch, or short horned breed; hide thin; horns short; tails set high; color red and white, nearly mixed; tender constitutions; fatten kindly, and yield large quantities both of milk and tallow.

4. Lancashire breed. with straiter horns than those of any other, spreading widely, and extending forward; large, and square built; fore quarters deep; milk not abundant, but rich; the animal hardy. From an intermixture of this breed with others, Mr. Bakewell obtained the Dishley breed, which are remarkable for fattening easily, and upon the most valuable parts; though they yield but little milk or tallow, when compared with some others.

5. Highland breed, or Sheyloes, with horns turned upwards; colors various, chiefly black, though sometimes brindled, or dun; hair long and close; bodies well shaped, best suited to

gold, mountainous countries ; good for milk, and kind to fatten.

6. Polled breed, shaped like the Devonshire breed, though rather shorter ; hides moderately thick ; hardy, and fatten kindly on the best parts ; flesh good, and well mixed with fat ; oxen good for draft. A variety of this breed of cows called the Suffolk duns, are excellent for the dairy. These are small, lean, big bellied, and of a dun color.

7. Alderney, or French breed ; small ; light red ; smooth, neat horns ; tender constitutions ; rich milkers ; flesh good.

8. Welch breed, chiefly black ; small, with horns thick, and turning upwards ; well shaped ; vigorous, and well calculated for labor.

It is believed that our cattle mostly resemble those of the Devonshire, but in comparing our cattle with the English breeds, it appears, as has been observed, that ours are made up of mixtures of different breeds, and that all the good properties of the English stock of neat cattle, are to be found among ours ; but so variously distributed that no specific characters can be given them.

Some few individuals in the United States have made efforts to improve our breed of cattle, by importing bulls and cows from some known specific breeds in Great Britain. But when we consider the enormous expense which those importers impose on our farmers, we have no great reason of gratitude to them for their patriotism in so doing. It is very obvious that it is to the peculiar mode of rearing and keeping their neat cattle, that we are to attribute their superiority, rather than to any excellence peculiar to their origin.

Were the same money which is paid to the speculator for his imported cattle, expended in the nurture, and better keeping, and managing our own native breed, we should probably by that means, make it equal to theirs, with a great saving of expense, and thereby expose the absurdity of the opinion of M. de Buffon, and many historians and philosophers of Europe, that all the animals in America are inferior in every thing which constitutes their proper perfection, to those of the same species in Europe ; and that there was something deficient and degrading in the American climate, with regard to the productions and powers of animal life.

If we would rival the English farmers in raising up an improved breed of cattle, we must make use of similar means with them.

The first object is to select the best cows we have among us, from which we must raise our calves ; and in making this selection, a due regard is to be had to the uses for which they

are intended. If the best milch cows are desired, select from the best breeds of those which are known to be the best for that use; those which yield the most of such cream as makes the best butter, in any one year, are generally to be preferred. The size of cows is not so material; as it is found that all cattle eat nearly in proportion to their respective sizes. What would be necessary to feed one of the large Lancashire breed of cows, would be nearly sufficient for two of the Alderney breed, before mentioned; while the milk of the two latter would probably nearly double that of the former. There is hardly any breed of neat cattle but what are sufficiently large for milch cows, if well kept.

A perfect cow, says the compiler of the Complete Grazier, should have a broad smooth forehead, black eyes, large clean horns, thick skin, large deep body, strong muscular thighs, large white or yellow udder, with long elastic teats, together with every other token requisite in a bull, allowing for the difference of sex. It is said milch kine are not good for breeding after they are twelve.

The signs of a good ox, says Mr. Dean, are thick, soft, smooth short hair, short thick head, gloss smooth horns, large shaggy ears, wide forehead, full black eyes, wide nostrils, black lips, thick fleshy neck, large shoulders, broad veins, large belly, thick rump and thighs, straight back, long tail well covered with hair, and short broad hoofs. The best colors are brown, dark red, and brindled.

When a cow is found to produce calves which make cows or oxen of the above description, she should be kept for a breeder, and her calves, provided they come in proper season, should be raised instead of being committed to the butcher, as they too often are.

Calves, for raising, should be brought forth early in the spring; those brought late will not so well endure the succeeding winter, and, if heifers, will usually go to the third year before they are with calf, while those that are calved earlier will usually bring forth a year sooner.

It often happens, through want of attention, that the best cows for breeding, bring their calves too late for raising, and is it not too generally the practice among farmers to be governed by no other rule of decision, with respect to the calves they will raise, except of their being brought forth in proper season: while they perhaps improvidently, let their best cows calve out of season, and for that reason kill them.

Heifers generally arrive at the age of puberty when they are eighteen months; though in some instances they have

brought forth calves before that time. The better they are kept, the sooner they will breed; if, however, they breed so early, they should be highly kept; for otherwise they will be apt to be stunted in their subsequent growth. Mr. Bakewell used to keep his Diskley breed of heifers from the bull until the age of three; Sir John Sinclair attributes to this their often missing being with calf. It is believed to be best to follow nature's law:—let them go to the bull as soon as they feel the inclination.

Breeds of cattle are much improved by crossing, or mixing different kinds together.

As the purest American breed is almost universally a mixture we may consider that a favorable circumstance to the raising from it a valuable stock, which may possess all the superior characteristics of the English breed.

But in doing this, much sound discretion and practical science is to be exercised.

In Great Britain, much pains has been taken to select breeds which should unite the two qualities of being the best for milking, and the kindest to fatten; but hitherto such breed is not to be found. It has been observed, however, by Sir John Sinclair, that by great attention, a breed might probably be raised, the males of which might be well calculated for the shambles, and the females produce abundance of milk, and yet when they reached eight or nine years, might be easily fattened. He further adds, that some of the English and Scottish breeds have nearly reached this point of perfection.

To improve the breed, it is also of importance that there should be no fornication between animals which are nearly related; no consanguinity between the bull and the cow which is put to him. This seems to be agreeable to the laws of nature, and among men is strikingly exemplified in the degeneracy of the race, where the posterity of some small secluded districts constantly intermarry with relatives; or where the pride of families has served to preclude a due intermixture with others.

For the bull, the finest looking calf, possessing as nearly as can be judged, the foregoing requisites for a good ox, should be selected, and from the finest of the breed which he is intended to propagate; and he should not be suffered to go to the cow until he has attained a good growth. Suffering young, or dwarfish, or ill looking bulls to go to cows, only tends to degenerate the breed; and in the two former cases, the cow, by being served with such, frequently misses having a calf.

The bull should have good keeping, so that he may be in prime condition when he is put to cows.

But although the circumstance of raising the best stock, and such as are brought forth in proper season, is essential to improve the breed, yet it is believed that the superiority of the English breed of cattle, is owing principally to the different keeping which they give them. Mr. Featherstonhaugh, a distinguished farmer, in the state of New-York, after a journey of fifteen hundred miles in the different states, for the purpose of viewing the imported cattle, and to examine the method after which their owners keep them, as well as the condition of our own native cattle, remarks, that in order to keep up the great qualities of the imported breeds, we must remember that in their native country it is considered indispensable to keep them extremely well, and in a very different manner from the general custom prevailing here; which is, in summer to leave cattle to help themselves to what they can find, even in the most severe drought; and in winter, to give them a moderate quantity of hay and straw. That in England, where they are less troubled with dry weather than we are, they give them green crops and roots in abundance, and that if all this provident attention be necessary in that moist climate, it is certain the breed will degenerate with us if it is not kept in high condition. He observed that he was convinced that negligence was the universal cause of diseases, and that they ordinarily arise from too high feeding or too low. In the one case, the digestive powers are embarrassed, in the other they are not sufficiently exercised, and in both the animal suffers; that animals, regularly yet plentifully fed and well housed in winter, are generally healthy.

In those places where milk may be considered so valuable as to make it an object to substitute other food for the raising of calves, the following experiment of Mr. Crook, mentioned in letters and papers of the Bath and West of England Society, are worthy of consideration. In 1787, he purchased three sacks of linseed, of the value of about nine dollars, which lasted him three years; one quart of linseed was boiled in six quarts of water for ten minutes, to a jelly, which was given to the calves three times a day mixed with a little hay tea. Thus he was enabled to raise in 1787, seventeen calves; in 1788, twenty three; and in 1789, fifteen, without any milk at all. He states that his calves throve much better than those of his neighbors, which were fed with milk. It appears from this statement that less than eighteen cents worth of flax seed, with a trifle of hay, is sufficient for one calf. Linseed oil

cakes, when pulverized and boiled, make an equally good jelly. Mr. Clift, of New-York, directs that after the calf has been fed for a fortnight with sweet milk, give it skim milk mixed with an equal or larger quantity of flaxseed broth, or jelly, and let be given to it milk warm. Enough jelly may be boiled at once for three or four days, but if the weather be warm it will be spoiled by souring. With this drink, he says, calves will thrive as well as if fed on sweet milk.

The following communication obtained from the agricultural society of Massachusetts, the prize for Mr. Rudd. He directs to take the calves from the cows when three days old, and feed them with gruel composed of one third barley, and two thirds oats, each ground fine and the mixture sifted. A quart of this gruel is to be given to each calf, morning and evening. The gruel is made by taking one quart of the flour and twelve of water, and boiling them together for half an hour, and is to be given when milk warm. In about ten days after commencing the feeding, tie up and suspend a bundle of sweet hay in the middle of the pen where the calves are kept, which they will eat by degrees. A little of the flour put into a trough for them to lick is also of service. Feed them till two months old, increasing the quantity as they grow larger. Half a bushel of the above mixture is sufficient for one calf.

The pasture into which calves are put, should be dry and sweet. White clover is thought to be the best. Red clover, or trefoil, is also good. Mr. L. Hommendice, recommends that there should be no water in the pasture, but sufficient of shade. The effect of this, he says, is that the calves learn to feed at night, when the dew is on, and lie by in the day time; and as grass while wet with dew is more nourishing, they will thrive in this way much better than when they have free access to water, which he says has a tendency to stunt them and make them pot bellied. But it is thought to be the better way to give them a little nourishing drink at certain times when the dews fail, or at mid day when the weather is very warm.

It is not sufficient for calves to be kept well until they are a year old, and have warm shelter in the winter. But it is too common for farmers, to turn their young growing cattle into pastures of stunted growth, or into woods where there is not sufficient for them to eat, by means of which their growth is retarded; and what is worse, they hereby often learn to become habitually unruly, from the constant temptation they are under of breaking into fields where there is plenty.

It is believed that the superior keeping of the English cattle

consists very much, if not principally in the quantity of succulent food with which they are fed during the winter season, such as turnips, potatoes, beets, carrots, &c.

This opinion must derive great influence from the consideration, that nearly one half of the year during the cold season, the food with which our cattle are kept, is such as has lost a very large proportion of its most nutritive constituents, by drying it for preservation.

On this subject the following remarks from the Massachusetts Agricultural Repository, are pertinent and interesting :

"It is observed by Sir John Sinclair, to whom agricultural science is much indebted, that although the mode in which manures operate on soils, is not so obvious to the senses as to be fully understood, there are three ways in which water promotes their improvement. It preserves a favorable degree of temperature ; feeds by conveying nourishing substances ; and so as a pure element, it is beneficial. To prove that water enters largely into the composition of vegetables, and is thus advantageous, the same writer observes: "That plants, cut green, and afterwards dried, lose by evaporation 66 to 70 parts of 100. The loss of weight by drying, will be found in this country to vary essentially from what takes place in Scotland, especially as it respects different plants. But our hay is of necessity made lighter by the heat of our summer, as well as for the purpose of its being stowed in large bodies and tight barns.

It should be premised, that the time of cutting the several grasses as in the following statement, was the same as is usually practised by husbandmen in New-England.

Of 100lbs. of vegetables cured in 1822, the product was as follows, viz.

100lbs. of green white clover, gave of hay,	-	17	1-2lbs.
100lbs. of red do. gave	- - -	27	1-2lbs.
100lbs. of herds grass gave	- - -	40	
100lbs. of fresh meadow gave	- - -	38	
100lbs. of salt grass gave	- - -	39	
100lbs. of mixed 2d crop or Eng. Rowan	- - -	18	3-4
100lbs. of corn-stalks gave	- - -	25	
100lbs. of do. cut in milk with the ear	- - -	25	

It should be observed that the weight will vary from ripeness, and many other causes, such as wetness of season, shade, thickness of growth, &c.

It appears from the above experiment, that eight hundred pounds of those vegetables on which we usually keep our cattle in the winter, there is a loss of five hundred and sixty-nine

pounds and one quarter of their weight, by drying it for a state of preservation: and when we consider the great prevalence of water in the composition of vegetables, we are led to conclude that this loss consists of those substantial aliments which are essential to the support of animal life."

It must be expected then, that the growth of cattle, fed only on such food during nearly half the year, and often only a scanty pittance of that, will be stunted in their growth.

It may be observed that there is a certain period of time, in which animals, according to the laws which govern their growth, arrive to maturity, and beyond which their natural weight will not be increased. If then, during a considerable part of this time, to wit, that part in which they are kept on dry food through the cold season, the progress of their growth is retarded, or perhaps stayed intirely, they never can be expected to arrive to that size and value, as if they were so nurtured that their growth continually progressed until they arrived to the utmost extent of size and value of which their constitutions would admit. If then, a plenty of succulent food given to cattle, through the cold season, will in a great measure have the effect to continue their growth, it is a natural conclusion, that such nurture of cattle, by the English farmers, is one great cause of the great superiority of theirs to those in general of our own country.

When roots of any description, proper and useful to feed cattle, are preserved from the frost for furnishing food during the winter season, it is well known that they retain their native juices; and it is pretty evident from the observation and experience of the English farmers, as well as from some of our own, that those alimentary juices in such roots, are a most efficacious substitute for green crops of grass. And there is no doubt but that those cattle in England, so distinguished for their extraordinary size, and valuable properties, are in a great measure indebted to their being kept in part on succulent food through the cold season.

Perhaps it may not be for the farming interest, at present, to go so extensively into the system of raising roots for the feeding of cattle, as is practised in England and some other parts of Europe, because we have more land for grazing, and the price of labor here is much higher. But there can be no doubt but that it would greatly improve the farming interest, to make the use of succulent food for cattle, the means by which we may gradually improve the breed, instead of incurring the enormous expense of importing cattle for that purpose from Europe; and

by which means, too, the farmer may derive more immediate profit from the stock which is now in his possession.

The editor of this work is aware of the objections which are made by our farmers, to the root husbandry, as it is sometimes called, and especially to that of turnips. It is said by some, they are a precarious crop, being exposed to the ravages of insects: and by others that they are of little utility as food for cattle.

Mr. Curwen, in England, who has been considered a great authority on the subject, and a practical farmer, relied on turnips and straw only, for his cattle, with occasional steamed chaff and salt, and never gave them corn, oil-cake or hay.

By that management he observes, he converts all his straw into excellent manure, keeping his grain for sale.

When we consider the great diminution of the value of grasses by drying them for preservation, it is worthy of great consideration whether those, especially, who cultivate small tracts of land, may not procure more animal nutriment from a given quantity of soil by the root husbandry, than would be obtained from the cultivation of green vegetables of any description, allowing for the extra labor.

There are various diseases to which neat cattle are subject, and assistance is not often to be obtained from those who are skilful in their cure: some account of those, and the most approved remedies may be useful in this work.

HOOF AIL.—Cause of the disease is not well known. The feet become diseased, and then they are frozen during the course of the winter, after which they are of no value except for their skins. Feeding them with plants of rich food, and keeping them well littered in warm stables, is thought to be the most profitable and effectual method of avoiding this disorder.

HORN DISTEMPER, subjects them to a wasting of the pith of the horn. It is sometimes in one horn only, and sometimes in both. Indications of the disease are coldness of the horn, dulness of the eyes, sluggishness, want of appetite, and a disposition to lie down. Where the brain is affected, the animal will toss its head, groan, and exhibit indications of great pain. *Cure*: bore a hole with a small gimblet in the lower side of the horn, about an inch from the head, and the corrupted matter in the horn will run out. If this does not complete the cure, Mr. Dean directs, that the horn have a mixture of rum, honey, myrrh, and aloes thrown into it with syringe; and that this be repeated till a cure be effected.

TAIL SICKNESS. Cause, generally poor keeping. The cure

is effected by cutting off a small piece of the tail, which will be attended with a small discharge of blood; or when the hollow part is near the end, cut a slit in it one or two inches long, and this will effect a cure.

GRIPES, or CHOLIC. When attacked with it, they lie down and rise up incessantly, and stick their horns against any object that presents. It is attended with either costiveness or scouring. In the former case, they are to be treated with purgatives, and in the latter, with restringents. To stop the purging, give them half a pint of olive oil sweetened with sugar; or a quart of ale, mixed with a few drops of laudanum, and two or three ounces of oil of sweet almonds. To promote purging, give them five or six drachms of fine Barbadoes' aloes, and half a pint of brandy, mixed with two quarts of water gruel, in a luke warm state. In either case, speedy attention to the beast is necessary, in order to prevent an inflammation of the intestines, which must prove fatal.

SCOURING SYMPTOMS. Frequent discharge of slimy excrement, loss of appetite, loss of flesh, increasing paleness of the eyes, and general debility. *Cure.*—The beast should be immediately housed, and put to dry food, and this in the early stage of the disease will generally effect a cure. Should this fail, it is directed by the same author to boil a pound of mutton suet in three quarts of milk, till the former is dissolved, and give it to the beast in a luke warm state; or in obstinate cases, boil half a pound of powdered chalk in two quarts of water, till it is reduced to three pints; add four ounces of hartshorn shavings, one of cassia, and stir the whole together; when cold, add a pint of lime water and two drachms of the tincture of opium; keep the whole in a corked bottle, and after shaking it before using, give one or two horns full two or three times a day, as the nature of the case may require. Sometimes however, this disease proves incurable.

HOVEN. Occasioned by eating too much when turned into rich pastures, by swallowing potatoes, or other roots without sufficient chewing, and to other causes. The stomach of the animal becomes distended with wind, and if a vent for this cannot be afforded, the beast must die. *Remedy.*—Open a hole with a sharp pointed knife, with a blade three or four inches long, between the hip and short ribs, where the swelling rises highest, and insert a small tube in the orifice, till the wind ceases to be troublesome. The wound will soon heal up again. Mr. Young recommends for curing this complaint, to take three-fourths of a pint of olive oil, and a pint of melted butter or hog's lard, and pour this mixture down the throat of the beast; and

if no favorable change be produced in a quarter of an hour, repeat the dose. For sheep, about a gill should in like manner be given, and the dose repeated if necessary. This, he says, will not fail of a cure in half an hour. To prevent this disorder, cattle should not be turned at first with empty stomachs into rich pastures; nor should they be allowed to feed on potatoes, and some other roots, without their first being cut into pieces.

STAGGERS.—This disease is known by the drowsiness, lethargy, and straggling gait of the animal. It is sometimes occasioned by plethora or fullness of blood, and sometimes it is seated on the brain; in which case it is incurable, except by trepanning. In the former case, the remedy is to keep the beast housed, and bleed and purge it sufficiently.

OVERFLOWING OF THE GALL, and which is sometimes called yellows or jaundice, is known by yellow tinge in the mouth and eyes, and sometimes the body assumes a yellowish cast, the nose is dry; the udder of the cow becomes swollen, and yields but little milk, which also becomes yellow, and curdled when boiled, and sometimes the fore teeth become very loose. *Remedy.*—The beast should be housed, and have two or three gentle purges; then give it twice a day a pint of beer, in which has been infused, for three or four days, about an ounce to each quart of the filings of iron, and a small quantity of hard soap. Let the beast be well kept during the time with warm messes of bran, and other nourishing food, to which some olive oil, and other purgative medicine should be added, if the beast be restive. For curing this distemper Mr. Dean directs, to take an egg and empty it of its white, retaining its yolk, and fill the cavity with equal quantities of soot, salt, and black pepper; draw out the tongue of the beast, and with a smooth stick push the egg down its throat. Repeat this two or three mornings, and he says, it will seldom fail of a cure. Sometimes this distemper does not yield to the power of medicine, but at length turns to the black jaundice which is incurable.

PANTASIE.—Symptoms are the panting or heaving of the animal's flanks, which is accompanied with trembling and a decay of flesh. *Remedy.*—House the beast, and give it every six hours during the continuance of the chilly symptoms, a

quart of warm strong beer in which a table spoonful of laudanum, another of ground ginger, and two of the spirits of hartshorn have been infused. The beast should be fed on sweet hay and well littered. Its drink should be warm water with a little nitre dissolved in it, if there be symptoms of fever. As it gains strength, let it out in the middle of the day, until such time as it has fully recovered.

INFLAMMATION OF THE LIVER.—Indicated by fever, difficult breathing, and swelling near the shorter ribs, and in cows a remarkable distemper about the womb. Cattle afflicted with this disorder will never fatten. It is said to be hereditary sometimes in certain breeds; in which case it is incurable. *Remedy.* House the beast, bleed it profusely, and give it the following medicine in a tepid state, to wit, salt petre and glauber salts of each two ounces; Venice treacle, mithridate and white ginger pulverized, of each one ounce; let them be boiled in three pints of water, in which may be gradually added, one gill of oil of sweet almonds, the whole being stirred together. This is sufficient for one dose, which should be repeated the succeeding day. Warm messes of bran should be the principal diet of the beast till it has recovered.

INFLAMMATION OF THE LUNGS: indicated by shortness of breath and a painful cough. The animal looks dull; the skin is hot and harsh; and a copious discharge of thick ropy phlegm issues from its mouth. *Remedy.*—House the beast, bleed it plentifully, and give it a dose composed of the flower of sulphur, balsam of sulphur, syrup of colts foot, and oil of sweet almonds; of each one ounce, blended together. If the above treatment produces no visible alteration in eighteen hours, repeat it. Probably any other purge would answer as well as the above. Let the beast be kept comfortable, and have some exercise every day till it recovers.

THE LOCKED JAW is said to be similar to that in the human frame, caused by similar means, and requires a similar treatment. If the beast be hardy, opiate frictions, and dashing on of cold water, is recommended. If it be of slender constitution, opiate frictions, and warm fomentations of the part afflicted is directed. As the beast cannot swallow, let gruel be poured down its throat with a horn, till the disorder is removed.

Cattle are sometimes poisoned, by eating poisonous plants or being bit with mad dogs. In the latter case, if the wounded part be cut away shortly after the bite, and then be kept open for some time, it is thought to be the only effectual remedy. It is said that any medicine which is very strongly antispasmodic, if given plentifully, and in proper season, will counteract the effects of the bite of mad animals.

It has been remarked that cattle in a plethoric or state, when over fed with rich food, or where too suddenly surfeited with it, are suddenly indisposed and carried off before relief can be given. It is believed, that among the horned race, either plentiful bleeding, or purging, or both will be found a preventative, and in most instances, a cure of the maladies which are usually most fatal to them from the full habit.

When oxen are drawn hardly in muddy roads, especially if the soil is calcaireous, they are liable to a soreness between their claws. This will make the beast lame; and when discovered, the part should be cleansed and healed, with some proper ointment. Sometimes from inattention to this, the part becomes horny; in this case, the hard parts must be cut away, and the wounded flesh cured.

A general indication of health in neat cattle is a moist or wet nose, and when this is found dry, it is a certain symptom of disease of some kind or other.

Cows have some diseases which are peculiar to them.

It should be kept in mind that the udder of the cow is divided into as many apartments as there are teats, so that if one or more of those is diseased, this does not affect the rest. The milk of one teat may be good and that of another bad.

GARGET.—The name of this disease denotes any hard swelling in the udder. As one remedy, Mr. Deane recommends making a rowel or seton in the dewlap, and inserting therein a piece of the root of mechoacan, as large as a nut meg, with a string fastened to it, so that it may be drawn out when the cure is effected; and this, he says will cause a revulsion of the humor in the udder into the orifice, in the dewlap, where it will be discharged. When the cure is effected, the piece of root is to be drawn out by the string. Probably a common rowel placed in the breast, or dewlap, would answer the same purpose.

In obstinate cases of ulcerated udders, the Complete Grazier

recommends, to take gum amoniac, gum galbanum, castile soap, and extract of hemlock, of each one ounce; form them into eight bolusses, and give one every morning and evening. The same author observes, that internal remedies are always necessary where the udder and teats are considerably inflamed, and for this purpose, he says, he takes four ounces of nitre mixed with a pound of common salt; give two table spoonfuls of this powder in a gallon of thin water gruel every three hours.

Where the inflammations are less violent, and exhibit no symptoms of increasing rapidly, it may answer to anoint the udder frequently through the day with fresh butter, or with a salve made of an ounce of castile soap, dissolved in a pint of sweet milk over a gentle fire; or with an ointment made with the juice of the leaves of them, mixed with hog's lard; if the malady increase, about a drachm of calomel may be given in a horn, full of warm beer.

When the teats are only sore, they may be washed with soapsuds and rubbed with an ointment made of white lead and goose grease, or fresh butter.

PUERPERAL FEVER, is caused by taking cold while calving. Cows thus affected should have warm housing, and it is said the head should be placed highest to assist the natural discharges. Blood should not be taken except in violent cases, and then only at the commencement of the disorder.

NURTURE AND MANAGEMENT OF THE DIFFERENT KINDS OF SHEEP.

This subject has been treated with great ability by Mr. Livingston, of New-York; but as his writings on this branch of rural economy are not extensively circulated, it is believed the following extract from them may render these essays more useful to the American farmer.

It is probable that different climates and soils have done much in producing differences among sheep; and probably

different kinds, as we now find them, have descended from stocks which were of the same genus, but possessing properties different from each other. It has been found that different soils are best suited to different breeds of sheep; and that the soil often serves eventually to produce a difference in sheep. Fat pastures, it has been observed, breed straight, tall sheep, and the barren hills, short, square ones. The large long woolled sheep of Great Britain require rich pastures; and it has been thought will suit them better than any other sheep. A wet soil, salt marshes excepted, is, however, unfriendly to sheep of all kinds.

It is important that farmers, in stocking their farms with sheep, should pay attention to such as are best suited to their soil.

It is believed that much of the high, moist lands in the northern and middle States, would be found suitable for raising the large long woolled English sheep.

But in the United States, as well as in England, it is an object worthy of attention, to have our farms stocked with sheep of various kinds, that our citizens may be supplied with the various sorts of cloths which are necessary in different uses. In England, they have the Teeswater, the Lincolnshire, and the Dartmoor breeds, which yield fleeces of long coarse wool, weighing on an average, from eight to eleven pounds. The wool of those sheep, and of the Heath, Exmore, and Berkshire breeds, which are smaller, and have still coarser wool, is made use of for the manufacture of blankets, carpets, and other cloths of a coarse texture. The New-Leicester and Bakewell breeds, and the Eastwold, and Romney-marsh breeds, have long wool also, but somewhat finer, being better fitted for the manufacture of worsted fabricks; and the average weight of their fleeces is from eight to nine pounds; the average weight of their quarters is from twenty-two to twenty-four pounds. The Bakewell is an improved breed, which was engrafted upon some of those before mentioned, and are, it is said, highly esteemed for the fatness of their carcasses, and the fine flavor of their mutton. The English have also various other breeds besides the merino, yielding fleeces of short wool of various quantities and qualities, the finest of which are the Dunfaced and Shetland breeds; the next finest is the Hereford, or Ryeland breed, and the next the South Downs. The latter, it is said, very much resemble our common sheep, having wool about equally fine, and that in England they are esteemed

next to the Bakewell breed. There is a new breed rearing in Virginia, by a Mr. Custis, which he calls the Arlington sheep, that yield fleeces of long wool, well fitted for the manufacture of worsted fabricks. They are said to be a mixture of the Bakewell breed, with a long wooled Persian ram, which was imported by Gen. Washington.

The island called Smith's Island, lying off the eastern cape of Virginia, is remarkable for producing a breed of sheep of uncommonly fine wool, which on account of the largeness and fineness of their fleeces, promise to be highly valuable, provided the breed does not degenerate, in a few years, when taken from that Island. They are shorn twice a year, and some of their fleeces weigh four pounds at each shearing.

These are the only breeds of this animal which it is necessary to notice; and the introduction of all these, it is evident, might be greatly conducive to the farming interest of the United States; and to derive the greatest advantage from them, it is obvious from the above account, that the great diversity of our soil requires different breeds suited to each, by their particular constitutions and habits.

It is well known that any considerable improvements, even in our common breed of sheep, have not been made in this country until within a few years; little or no attention having been paid to appropriating to them the soil best suited to the particular breed we might happen to possess.

A proper consideration of the peculiar properties of the different kinds of sheep that have been mentioned, may induce the farmer to introduce such as may best comport with his disposition and his interest.

The merino breed have of late been considered the most profitable.

Though it may be doubtful whether the extraordinary price which their wool has heretofore commanded, has been of general utility to our country, unless it might be considered an unavoidable tax, necessarily imposed by those who introduced them. It is believed to be well for our farmers generally, that the increase of the merino sheep has so soon diminished the price of the wool, as might be expected; as the profits which have heretofore been engrossed by a few speculators, are now becoming generally distributed among the great mass of our common farmers. One of the greatest advantages to be derived from this breed of sheep, is to enable us to manufacture a finer quality of cloth from our own produce, which we should

otherwise import from foreign countries. It is found also, that by mixing the breed with our common sheep, the wool which is intended for cloth of a coarser quality, is thereby greatly improved. Mr. Livingston says, that in improving the breed of these sheep, the size of the ewes, more than that of the ram, governs the size of their lambs; that the ewes of a small race cannot bear large lambs, though the ram be ever so large. For this reason, the lambs which are raised from a merino ram on our common ewes, will be larger than those raised from one of our common rams on merino ewes. This is the reason why rams of the large English breed, when brought here, do not produce a race any way corresponding to their own size. He therefore recommends the engrafting a merino stock upon our common ewes, to increase the size of the breed; though if they only eat in proportion to their size, as has been proved in many experiments, this is not so material.

The following rule is given for a judicious selection of the ewes: Let them be at least three years old, as large as can be obtained of the sort,—with the belly large and well covered with wool, chine and loin broad, breast deep, buttocks full, the eyes lively, the bag large, and the teats long. In addition to these qualities, they should have fine, short, thick wool, their bellies well covered, and with the least hair on the hinder parts. In the choice of the ram, which we will suppose to be three fourths blooded, select one that is of good size, broad in the chine and loins, deep in the carcase, the back straight, the ribs well set out, so as to give room for a large belly well covered with wool, the forehead broad, the eyes lively, (a heavy eye being a mark of a diseased sheep) let him also be strong, close knit, and active, of which you can judge by taking hold of his hind legs; and let his wool be of a good quality, and as clear of hair in the hinder parts, as possible. It is said that the product of such a ram with common ewes, would be lambs possessing nine twenty-fourth parts of merino blood; and twice repeating the females of the successive products, would give three fourths blooded lambs. Two further repetitions from a full blooded ram, would give lambs possessing fifteen-sixteenths of merino blood, which is probably sufficient. The ram should be changed at each time; as the rearing of succeeding stocks between which there is the closest consanguinity, must inevitably tend to degenerate the breed.

The shearing of the merino sheep may be some later than that of others, as their wool never falls off. The merino wool

cannot be washed sufficiently until after shearing. But those sheep whose fleeces are washed before, should be kept some days previous to shearing, after they are washed, which will render the shearing more easy, and require less oil to be afterwards added for spinning. The fleece of the merino sheep being more close, this operation is more slow and difficult, and it is thought best to use for that purpose, shears with blades much narrower than those of the common kind. In England it is a common practice after shearing, to smear the bodies of the sheep with a mixture of tar and fresh butter, which serves to cure the wounds in the skin, and to fortify their bodies against the cold. This mixture may be improved by a small quantity of sulphur. They should be again anointed in the month of August, thoroughly on the back and sides, by parting the wool for that purpose. This ointment is useful to cure any wound made by cutting, and effectually to destroy all the ticks, which are very pernicious to sheep. During cold rains and cold nights after shearing, they should be placed where they can go into their house, or place of shelter, when they please; as they know best when they want shelter, and when they become so warm as to require the open air.

They should at all times have plenty of salt, but particularly after shearing, as it is a stimulus which enables them to withstand the cold the better.

• A warm sun is injurious to the backs of sheep after shearing; their pasture should therefore have some shade, to which they can retire during the heat of the day.

The wool of yearling sheep should be kept by itself, because not having the same texture or strength which the wool of older sheep has, it will make the cloth shrink unequally if mixed with such wool. Some think it best to sort the other fleeces also, at shearing time, making separate parcels of the thighs, the belly, and the back sides, as the texture of these is often so different as to render it inexpedient to wash it together.

The following is an European method of managing merino wool before carding. After it has been sorted, and is to be manufactured in the family, let it be covered with soft water, mixed with one third urine, and stand fifteen hours, or longer if the weather be cold. A cauldron is then to be put in the fire with some soft water, and two thirds of that which covers the fleeces be added to it. When so hot that the hand cannot bear it, take out the wool, put it in a basket, put the basket in the cauldron, and then wash the wool by pressing, without any

wringing of it, and then cleanse it in running water. If this water in the cauldron become too dirty, take more from that in which it was first soaked. Dry the wool in the shade, not in the sun; let it then be beaten with a rod, which takes out all seeds, &c. and softens it; then pick it by opening it lengthwise carefully, and card it with cotton, not with wool cards.

Carding machines are not to be used for this wool, unless particularly fitted for it.

Mr. Livingston however, is of the opinion that if the wool be carefully picked and carded, so as to get out most of the dirt, and woven in this way, that it will answer without washing; in which case less oil or grease will be necessary.

Mr. Daubenton, a celebrated French Agriculturalist has observed, that when his sheep were fed on dry fodder during the winter season, many of the young ones dropped off; and that he found, on opening them, the food in the third stomach, which is that which receives the food after the second chewing, to be so dry as to be unfit for digestion, and to this cause he ascribes their death. This state of the stomach he concludes, is produced by the sudden change of food from grass to that of dry fodder. The antidote against this, is to feed them when they are first put to hay, with a proportion of succulent food, such as potatoes, turnips, carrots, cabbages, rape, &c.

Those farmers who would succeed well in raising a good breed of sheep, should make it an object of particular attention, to adopt this practice of feeding their sheep with these kinds of vegetables, especially at the setting in of winter.

It is very probable that the superiority of the sheep in Great-Britain, is owing altogether to their different mode of keeping them; especially to their keeping them through the winter on succulent food, as they do their cattle; by means of which they are not stunted in their growth until they arrive to the age assigned for them, to acquire the utmost extent of size which their nature and constitution will admit. The farmers in England, and some of the first practical farmers in the United States, do not think they can well succeed in rearing and supporting a good breed of sheep, without feeding them abundantly through the winter with succulent food, such as carrots, turnips, &c.

The following are some of the most common diseases to which sheep are liable, with the remedies which have proved efficacious.

ROT. A disease in sheep similar to pulmonary consumption in men. It is said to be caused by keeping them in a pasture that is too moist, producing rank and watry grasses. The raging of this distemper in a flock of sheep is stopped by removing them to a dry situation; but the individuals which are deeply seized with it, are seldom cured. Cough is a constant symptom. The lungs decay, and the whole body droops and languishes in the same manner as persons in a hectic. The sick in the flock should be removed from the sound sheep, that the infection may spread no farther among them. Parsley is recommended as being eminently serviceable. A spoonful of common salt for each, with a similar quantity of flour in a pint of water, once or twice a week, as a preventative; and if the disorder be in an incipient state, a similar dose administered four or five successive mornings, will probably effect a cure: as the addition of the flour and water not only abates the pungency of the disease, but disposes it to mix more gradually, though more efficaciously with the chyle. Dr. Darwin is of the opinion that the salt would be more serviceable if it were combined into a ball with about sixty grains of iron filings, by means of flour, and introduced into the sheep's throat every morning, for one week.

The following recipe for the rot in sheep, is from Young's Annals, vol. 13, p. 209:

"Give to each sheep one spoonful of spirits of turpentine, mixed with two of water: after fasting twelve hours, let them have three doses, staying six days between each dose. This is said to have been used with success, even in cases where the fleece has been nearly gone, and the throat terribly swelled."

SCAB. This appears by the sheep rubbing the part affected, and pulling out the wool in that part with their teeth, or by loose locks of wool rising on their backs and shoulders. "The sheep infected is first to be taken from the flock, and put by itself; and then the part affected is to have the wool taken off, as far as the skin feels hard to the finger, washed with soap-suds, and rubbed hard with a shoe brush, so as to cleanse and break the scab. Then anoint it with a decoction of tobacco water, mixed with the third of ley of wood ashes, as much

grease as this ley will dissolve, a small quantity of tar, and about an eighth of the whole mass of the spirits of turpentine. This ointment is to be rubbed on the part affected, and for some little distance around it, at three different times, with an interval of three days after each washing. With timely precaution, this will always be found sufficient.

Sir Joseph Banks, in a communication to the society for the encouragement of the arts, directs, also, for this disorder, pure quicksilver one pound, of hog's lard, four pounds, to be triturated in a mortar till the mercury be completely incorporated with the ingredients. The method of using this ointment is as follows: the head of the sheep must first be rubbed, after which a furrow is to be drawn with the finger from the region between the ears, along the back to the point of the tail, so as to divide the wool till the skin be exposed to the touch. Next, the fingers, being slightly dipped in the preparation, should be drawn along the skin. Similar lines should be opened down the shoulders and thighs, as far as the wool extends; and if the animal be considerably infected, two other furrows are directed to be traced parallel to that on the back, and one should likewise be drawn downward on each side between the fore and hind legs. After this application, the sheep may be turned among the flock, without any danger of the infection being communicated.

Another remedy is, an ointment composed of three parts grease, and one of spirits of turpentine.

Ticks. These may be destroyed by oil, a strong decoction of tobacco, or tobacco smoke. The smoke may be taken into the bellows, the wool opened, the smoke blown in, and the wool closed. This should be repeated at proper distances, over every part of the body.

A still easier method, though perhaps not so immediately efficacious, is, to part the wool of the animal on each side of its spine, from its head to its tail, and drop some Scotch snuff in the opening.

STAGGERS is a species of the apoplexy, arising from too great fullness of blood. It principally attacks young lambs, which fall down, and if not timely relieved, immediately perish.

The mode of cure, generally adopted by shepherds, is to bleed the creatures frequently in the eye vein, and to remove them scarce to a pasture, with a view to prevent a relapse.

HOVEN, OR SWOLLEN. It has been affirmed that a small quantity of ley, made either of wood ashes, or pot or pearl ashes, turned down the throat of a sheep that is hoven or swollen, by eating too much green or succulent food, will give immediate relief.

PURGING. When sheep are first turned to grass, a slight purging will not hurt them. But when this is severe the sheep should be housed, dosed with castor oil, and fed with some crusts of wheat bread.

THE FLY OR MAGGOT, is an insect which breeds in the skin of sheep. If the animal is a tacked before shearing it becomes sickly and indisposed; its wool not yielding a sufficient quantity of yolk, offers a warm nest for the reception of the eggs, which are speedily hatched. The maggots immediately feed on the flesh of the sheep; and if they be not timely destroyed, the vermin will multiply so rapidly as to destroy the animal in a short time. The remedy recommended is corrosive sublimate and turpentine rubbed into the sore. Probably spirits of turpentine, or fine salt, would be equally efficacious.

Mr. Livingston, in the transactions of the agricultural society, New-York, observes that the legs of sheep are furnished with a duct, terminating in the fissure of the hoof; from which when the animal is in health there is secreted a white fluid, but when sickly the ducts are stopped by the hardening of the fluid; and that he has in some instances found the sheep relieved, merely by pressing out the hardened matter with the finger from the orifice of the duct in each foot, and thinks that it may in some cases be proper to place their feet in warm water, or to use a probe or hard brush for cleansing this passage."

A writer in the Massachusetts Agricultural Journal, vol. 3, p. 351, observes that "the dysentary or flux in sheep has been cured by rubbing with a cob between the sheep's hoofs."

WORMS IN THE HEAD OF SHEEP.—The symptoms of this complaint are seen in the animals lopping their ears, shaking their heads, scouring, stupidity, loss of appetite. These generally terminate in consumption and death.

Remedy.—Force vinegar, by a syringe into the head of the sheep. This will produce sneezing, and convulsions in the sheep, by which the worms will be discharged."

These are the principal diseases to which sheep have been subjected. Others may hereafter be discovered peculiar to our climate, and the condition of this animal, and the management of the shepherd. There has been much diversity of opinion respecting the best covering provided for the sheltering of sheep from the inclemencies of the season. That which seems to be most generally approved is a shed open to the south when circumstances will admit; the extent of it to be apportioned to the number of sheep intended to occupy it. It should be so large on the ground, that they are not crowded when collected under it, nor exposed to very driving storms, of either rain or snow, but should be left to act from the impulse of their own inclination, as the proper time to repair to the shelter provided. Whenever it is practicable, it is believed by many, to provide light moveable coverings to be placed in the pasture during the summer season. For feeding them, small narrow troughs should be provided for their esculent food and salt, and small racks for hay or other dry fibrous food.

REARING AND MANAGEMENT OF SWINE.

The best means of rendering the raising of this useful animal most profitable, are not equally in the power of those who would use them. The proprietor who improves only a garden, or a very small tract of land, must depend on the economy of his domestics, and his industry, for the supply of such vegetables as may be necessary for the growing and fattening them: and the exigencies of his condition will generally lead him to the discovery of the most profitable means of obtaining this object. The little savings from the gleanings of the table, sour milk, and weeds from the garden, must generally constitute the principal food for raising one or two hogs to a suitable size for fattening, among the poorer class of citizens. But it is generally found that this class make as wise a use of the means in their power as those who are enabled to carry on the business of raising and fattening swine, upon a more

extensive scale.* But to the occupants of land, of every description, whether they keep but one or more hogs, it is of importance that they should have such as will give the greatest weight from any given quantity of food. It is a very favorable circumstance in this branch of rural economy, that the long legged, long nosed, and long quant bodied hogs are nearly extinct in every part of the country; and that the grass breed. and a mixture of the grass breed with the Chinese, generally occupy their places. There are some others possessing similar properties, and known by the names of those persons who have introduced them into different parts of the country.

They are distinguished in their general texture by a moderate length in proportion to the size of the body; the head and cheek plump and full, neck thick and short, quarters full, carcase thick and full, hair fine and thin. These are marks of a good hog, and the farmer who would improve the breed should not rest satisfied, until by crossing the Guinea breed, the Chinese and some other of a similar breed, with our old common breed, they have obtained hogs of the above description.

George G. Banet, Esq. when American consul, at Malaga, Spain, some years since, in a letter addressed to the Albany County Agricultural Society, advised to introduce from Spain, a breed of hogs, which he observes are seen in droves of hundreds all over Spain, and that they subsist in summer on weeds, and with a little corn in autumn, become astonishingly fat, and make the most delicious pork in the world.

To improve our breed of hogs, it has been remarked that "the sow will bring forth a stronger and better litter if she be kept till she is a year old before she goes to the boar, and he should be kept till that age, before he is put to sows. He should be kept in good condition for the purpose, and as the author of the Complete Grazier observes, should not serve more than ten sows in a year. The sows should also be kept in good condition, but not too fat; as in that case they will not produce an abundant litter of pigs. To cause them to go to the boar if they miss the right season, give them says he, some parched oats in their wash, or the small end of a runnet bag. If, however, they are well kept, they will seldom require any stimulus to colition at the proper time.

Those are reckoned the best breeders that have about ten or twelve paps. They should be kept clean and well littered,

* See the cottager's account, Shropshire, England.

bu should not have too much litter at the time of farrowing, least they over-lay their pigs in it." As sows will sometimes eat their own offspring, it is said that supplying them with plenty of water at this time will prevent this mischief. Pigs for market should be killed at about the end of four weeks. The castration and spaying the rest may as well be performed at about the age of six weeks. When milk or whey cannot be had, a thin drink of pea, buckwheat, or Indian meal may be given them. After the age of three months they may be turned out with the larger hogs into the clover field, which will keep them well, during the rest of the growing season. Mr. Young says, pigs should be weaned at the age of eight weeks.

The great objection to making the raising hogs for market an object of agricultural pursuits, has been the great expense of labor in raising grain for fattening them. This objection will be greatly obviated by introducing the grass breed. Those who have land plenty, and would keep any considerable number of hogs, no doubt may save a great portion of the expense by keeping them through the summer, in the method which has heretofore been practiced of giving them more or less grain through the year, with the wash of the house and milk of the dairy. Those who go largely into the raising of swine in Great Britain, and some parts of our own country, appropriate certain fields enclosed for the purpose, and well stocked with white clover, and other good grass, which constitutes their principal food through the summer, and until they are shut up for fattening. The celebrated Mr. Young prefers soiling them in a yard for the purpose; and in this case he makes use of lucern, richory clover, tares, and other green food, cut and carried in for feeding them. The water crow-foot, *rununculus aquatilis*, is also highly recommended for this purpose. But it is observed by the author of the Farmer's Assistant, that this method, though it may save some ground in pasture, and may be the means of making considerable manure, does not seem so apparently beneficial as the practice of soiling some other animals. Mr. Young mentions his having fed sixty-four hogs, great and small, on two acres of clover alone, during one season, and that they all grew very well.

The pasture in which they are kept should have a supply of water.

It is well remarked in the New-England Farmer "that the pasturing with swine will enrich land more than pasturing with

other beasts ; and hereby the profit of the farmer will be increased. And if a common clover lay, will produce a good crop of wheat, much more may be expected of the same kind of ground, after pasturing swine upon it ; as their dung adds much to the fertility of the soil. Hogs may be turned into their pasture about the first of May, and kept in it till the last of October ; and if the grass should not be quite sufficient for their support, some potatoes or other roots may be thrown to them.

When it can with convenience be done, it is an excellent piece of husbandry to make a hog pasture of an orchard ; their dung is allowed to be the very best of manure for the trees. They will keep the ground light and loose, destroy insects that infect the trees,* and feed heartily on the premature apples that fall, which the farmer is too often tempted to grind up for cider. An orchard may be prepared with clover, as we as any other spot of ground." If the trees are young and small, they should be secured by stakes drove in the ground around them, to prevent their being wounded by stripping off the bark. The loss which the farming interest sustains by suffering hogs to run at large in the highways, is so obvious that no good husbandman should suffer it in those districts where by law they are commonable. It is observed by Mr. Deane, that to prepare a pasture for hogs "the ground should be broken up, tilled and manured, and then laid down with clover ; for swine are more fond of this grass than of any other which our country producees. Let the quantity of land be so proportioned to the number of swine, that they may keep the grass from running up to seed ; for this will prevent waste ; and the shorter the grass is the sweeter it will be, and the more tender and agreeable to their palates. The same author supposes that one acre of rich land in clover will support twenty or more swine, large and small together, through the summer, and bring them well forward in their growth," and that "it has been proved, by many trials, that hogs in such a pasture may be kept in good plight, without any other food."

While they are young let the top of the gristle of the nose be paired off with a sharp knife, which will ever afterwards prevent their rooting up the sward, and answers the same purpose as ringing.

It has been uniformly remarked, that, although these animals

*See an account of the Curicules in essay on insects.

are naturally filthy if left to themselves, yet the cleaner they are kept, the better they will grow and fatten.

To those who would raise hogs without that tillage which may be necessary to raise a suitable quantity of grain for that purpose, it may be proper to remark, that some farmers, both in Great Britain and America, have practiced keeping them through the winter on boiled or steamed clover; hay. In that case the clover should be cut a little sooner than usual, and should be well cured, and have about a peck of salt to each ton, when laid down in the mow. For boiling in this case, as well as for boiling roots, and for other purposes, a wooden vessel full of holes at the bottom, is placed over the boiler which holds the water and which is heated underneath; being set in a brick stove, or furnace for the purpose. The steam from the boiler runs through the holes in the bottom of the vessel which holds the articles to be boiled or steamed, and after passing through them, is let off at the top; not faster however than is necessary, being partly confined with a lid. If the hay or other articles are to be boiled in water, the steam is conducted by a tube into the bottom of a vessel holding the water, into which articles are to be put.

The steam boiler is a necessary article in rearing swine, and for other purposes which every farmer should possess, if consistent with his condition.

In some parts of our country, great account is made of boiling potatoes, and carrots, and other roots, as winter food for swine; and in the more southern parts of the United States, where it is less difficult to preserve roots from the frost, the same measure would no doubt be equally profitable and practicable.

But our common farmers, in the more northern climate, will probably, in their present condition, think it expedient to rely more on hard food, such as corn, peas, oats, &c., because they are attended with much less expense in preserving and feeding; these however, will prove much more efficacious when ground and boiled, or steamed.

It is observed by the author of the Complete Grazier, that when many hogs are put up together to fatten, they will fall away at first, if ever so well fed; which he attributes to the noise and confusion produced among them by this new state of keeping; he observes too, that in such cases it is not unfrequent for one of the family to become so much the object of hatred to the rest, as eventually to be killed by them; and from all this he infers that it is much better to have them in a number

of small companies detached from each other, so that the noise and bustle will be less, and in order that they may more unmolested enjoy the repose which is most suitable to their drowsy faculties. For this purpose the sty should have a number of distinct apartments by close partitions from each other, and where the inmates of each can come forward separately to the general feeding trough, and retire separately again to rest.

To increase the appetite of hogs, when fattening, it is said a dose or two of sulphur should be occasionally given them in their food. Change of food is also good for that purpose. Laxative food should be avoided, as they are seldom costive. If they are too much so, a little rye will generally prove efficacious as a remedy. Mr. Young says it has been found that the best method of feeding all kinds of grain to hogs, is to grind it to meal and mix it with water, in cisterns made for the purpose, in the proportion of five bushels of meal, to a hundred gallons of water; the mass to be well stirred several times each day, until it has fermented and become acid, when it will be ready for use. In this way two or three cisterns must be kept fermenting in succession. He further remarks, that the profits will amply pay the expence. Is not the correctness of this remark, as it relates to the condition of the farmers in our own country, evinced from the nutritious effect which the grains of distillers, and the refuse of starch factories, has in fattening hog's. Were the nutritive substances contained in these articles of food separated entirely from the water with which they are mixed, and in that condition fed to swine, we should doubtless find a great diminution of their efficacy. It has been observed that the cause of pork, as well as other meats shrinking very much, and losing much of its oils in cooking, seems not to be well understood; but that it is generally believed the more fully any animal is fatted, the less will its meat shrink and part with its oil in cooking.

DISEASES. MEASLES.—This disorder is mostly in the throat, which is filled with small pustules, and sometimes these appear on the outside of the neck. The animal affected looks languid, with red eyes, and loses flesh. *Remedy.*—Give him small quantities of levigated crude antimony in his food.

THE MANGE is like the scab in sheep, a cutaneous eruption of the skin, is occasioned by want of cleanliness in the

hogstye. It is known by the violent rubbing of the animal till he tears the pustules, and thus produces scabs. *Remedy.*—First wash the animal with strong soap suds, then anoint him with an ointment formed of an ounce of the flower of sulphur, two drachms of fresh pulverized hellibore, three ounces of hogs lard, and half an ounce of the water of hali. This is to be rubbed in at one time, and is sufficient for a hog weighing one hundred. This will be sufficiently efficacious if the hog be afterwards kept clean. When he has a slight cough, doses of antimony, and from half an ounce to an ounce and a half is recommended, according to the size of the animal, to be mixed with his food for ten days or more. But where from long neglect, the neck, ears and other parts become ulcerated, they should be anointed every third or fourth day with an ointment made of equal parts lard and mutton suet, melted together, till the cure is completed.

THE MURRAIN OR LEPROSY in swine, is known by the shortness and heat of the breath, hanging down of the head, lagging, and secretion from the eyes. It is said to be caused by hot seasons, when the blood becomes inflamed. *Remedy.*—Boil a handful of nettles in a gallon of small beer, add a half a pound of flour of sulphur, a quarter of a pound of anniseeds, pulverized, three ounces of liquorice, and a quarter of a pound of elecampane, and give this mixture in milk at six doses.

THE GARGET is an inflammation of the udder, by being filled with coagulated milk. It is said chiefly to happen when sows are too fat at littering; and when they are thus affected the pigs will not suck. In slight cases the udder may be bathed with camphorated wine; but the milk must be squeezed out by hand if possible. If relief cannot thus be given, it is best to kill the animal.

DRY COUGH and wasting of the flesh, is best remedied by a dry, warm sty, with a regular supply of food that is calculated to keep them cool, and to allay their irritation of the lungs.

FEVER OR RISING OF THE LITES, appears to be caused by overfeeding, and may be remedied by doses of sulphur and oil. In reviewing the causes of diseases in swine, it will be seen that they may often be prevented by proper care and management.

MANAGEMENT OF BEES.

In every swarm, or hive of bees, there are two sorts, beside what is called the queen bee. She is distinguished by being larger, and of a lighter red than the rest; and it is said by those who have investigated the economy of bees, that she is the leader of the swarm, and lays the eggs in the cells for new broods, which consist of thousands every year. The other kinds are the drones, which have no stings, are the darkest colored, and are supposed to be the males; and the honey, or working bees, which are much the most numerous.

The bee-hive ought to be placed at a suitable distance from places where cattle are kept, or where horses are tied; and from places where filth of any kind is collected. It should be open to the south, with the other sides close. It should stand leaning forward a little, with the front part of the roof projecting over considerably, to prevent southerly rains from wetting the hives. These should be kept dry, clean, and warm during the winter; though not so warm as to tempt the bees abroad in warm winter days.

The following method of managing bees is recommended by Mr. Deane: place three hives of the same dimensions, say ten inches in height, each, and fourteen inches in diameter each way, are to be placed one on the top of the other. The two undermost ones are to have square holes in the top, about three inches in diameter, and covered with a sliding shutter. Let each hive also have a place of entrance, two or three inches long, and a third of an inch wide. The square holes in the two lowermost are to be open. The bees will fill the uppermost hive first. When this is full, which can be ascertained by weighing it in a cool morning, when the bees do not stir, take it off and carry it into a room, with a window open to the morning sun, and as this enlivens the bees, they will fly off to their accustomed place, and commence their labors in storing the second hive, which should then have the hole in its top closed. When this is filled, the same process is to be repeated; but when they have filled the last hive, let it remain for the winter stock of provisions for the swarm. In taking out the honey from the hive, which should be done speedily, let those bees which are found unable to fly, be thrown into a tub of water, out of which they can crawl again, and they will soon recover their wonted activity, and go after their companions. In this way there is no necessity for the process of fire and brimstone

for getting rid of the bees, a method unnecessarily destructive to their race.

Another method of taking the honey without killing the bees, is, when the hive is filled with honey, in the night season turn it bottom upwards, and set an empty hive of the same size, with its bottom exactly on the bottom of the other: let there be one or two cross pieces within the empty hive, for the bees to light on: then take a stick and strike gently on the sides of the full hive, and the bees will leave it and ascend to the upper one. When they have all got into this, take it off gently, and set it where the full hive stood, and the bees will go to work again as before. This is said to be the method usually practised in France.

The following management is said to be an improvement:—Have a hole in the top of the hive, covered with a shutter, as before described. When this is filled, which is to be known by the bees lying inactive about its mouth, open the hole above, and set a small hive on the top, into which they will ascend, and fill it with the purest honey, without any mixture of the bee-bread. When full, take it off as before directed, and place another in its stead. The bees in the full hive will soon fly off to the old one, and the swarm will re-commence their labors in filling the empty one again. When full, take it away as before, and set the empty one in its place. These upper hives should hold about seventeen pounds of honey when filled, and such the swarm will usually fill three times in a season. The honey in the lower hive is to remain for their winter food.

Either of the methods which have been here described, may with proper attention prove successful. Those who wish to derive profits from this useful insect, will soon learn from observation and experience, the method of managing them which appears best.

It is sometimes necessary to feed bees when their stock is exhausted; and as honey is the most natural food for bees, it is to be conveyed by small troughs into the hives, until they are able to provide for themselves. It is said that bread soaked in strong ale is also good to give them, and that they will consume the whole of it. It may be advisable, sometimes, to join two small swarms together. To effect this, the hives intended to be joined, are to be placed with their bottoms over those of two empty ones: a piece of dried mushroom, commonly called puff-ball, is set on fire, is placed under each full hive so that the smoke will ascend into them, and when the bees become

stupified, let the full hives be knocked gently on the sides, and the bees will fall into the empty ones in a torpid state ; it is expedient, then, if practicable, to find the queen bee of one of the swarms, and kill it. The two swarms are then to be put together, mixing them well, and dropping them among the combs of the hives they are to inhabit. The door of the hive is then to be covered with a cloth, so that they cannot get out. The second night after their union, remove the cloth in the dusk of the evening, and the bees will sally forth ; but as the night approaches they will return. Keep them confined three or four days longer, letting them out in the evening as before, and then the cloth may be removed.

To preserve bees from the worm, or butterfly, which sometimes proves destructive to them, one remedy proposed, is to raise the hives up about the first of May, and strew some fine salt under the edges, which will drive the worms away. This has been tried with success.

It has been said, also, that the ravages of this insect may be prevented by simply raising the hive two inches with blocks, one under each corner ; this will give the bees an opportunity to clear the hive of this pest, and other filth, and also keep the hive cool.

When the sun shines warm upon the south side of the beehouse, in the months of February and March, the bees are sometimes induced to venture abroad, to void their excrements and get water ; and as soon as they come in contact with the cold air, they fall upon the snow and are lost. Hives almost full of honey are sometimes deserted in this manner. To avoid this loss, the door on the front of the hive should be kept shut during the warm days in those months.

It is said that during the working months bees should be often salted with fine salt, as it will conduce to the health of the insect, and also improve the flavor of the honey.

Honey has medicinal qualities, is a great luxury, and a profitable article of consumption. It is therefore strange indeed, that so many neglect the economy of keeping bees, when it is considered they support themselves by their own industry, with only a very trifling expense.

INSECTS.

Insects of some description are continually preying upon the labors of the farmer, and in many instances it is difficult, if not impossible, to provide adequate remedies against their ravages. Some account of those which are most injurious to vegetation, together with the best remedies that have been discovered to prevent their ravages, shall here be given.

CANKER WORMS are insects of the species of the miller, which about eighty years since, made their first appearance in the oldest settled parts of the New-England States, and were called canker worms because they produced an effect upon the apple-trees similar to that produced by canker. One of the most effectual methods to prevent their ascending the trees, which the female does early in the spring, to deposit her eggs, is that which is found equally effectual in preventing the ascent of caterpillars, that is, to fasten a strip of sheepskin, with the wool outwards, round the body of the tree. This, it is found, is a barrier they cannot pass, as in attempting to climb over the wool they lose their hold, and fall down. Another method is, to fasten a piece of oiled paper about the tree, with the lower edge projecting out an inch or more, and standing downwards, which edge they cannot pass. These strips must be closely fitted round the tree to prevent their passage between them and the body. The scraping off the shaggy parts of the bark is also recommended, in order to deprive them of places of safety from birds, and of shelter from storms. Mr. Forsyth also recommends, that the bodies and large limbs of the trees be whitewashed with lime and water, or with a mixture of old urine and soapsuds for keeping off all insects.

CATERPILLARS. The above directions it is said, are also equally applicable to these insects.

When a nest of them are formed, run a pole into it, twist it round till the nest and its contents are wrapped round the pole, and bring the whole down and kill the worms. Let this be done in the morning, when the worms are all in the nest. If any escape this operation, repeat it when they have rebuilt the nest. This remedy is thought to be more efficacious when applied in a shower of rain. When the nests have been suffered to remain till the insects have left them, young broods for the ensuing year, will the next spring be found on the trees, in the

chrysalis state, under the shelter of a dry curled leaf or two, bound with filaments like cobwebs; these should be searched for and destroyed. It is said that caterpillars will take shelter under woollen rags, when put on trees where they resort, from which they can easily be taken and destroyed.

GRUBS are large maggots, produced from the eggs of a certain species of the butterfly, very injurious to corn by eating its roots. They are said to produce the beetle. Frequent ploughings will nearly destroy them.

TOP, or SPINDLE WORMS, are white worms, resembling grubs, found in the central hole which is formed by the leaves of Indian corn; and they there cut off the stem which forms the top of the plant. They are mostly to be found near barnyards, and in rich spots. They are discovered by their excrement appearing on the leaves. Sprinkling the corn with a weak ley of wood ashes will extirpate them.

BLACK WORMS, called also the **CUT WORM**. Ash colored worms, with black stripes on their backs. When full grown they are of the thickness of a goose-quill, and about an inch and a quarter long. They hide in the soil by day and commit their depredations by night. They eat off young plants above ground, and frequently endeavor to draw them under. It is said that manuring the ground with salt will drive them from it, and that lime and ashes will also have neraly a similar effect.

RED WORMS. These are slender, about an inch long, with a hard coat, and pointed head. They eat off wheat, barley and oats, above the crown of the roots; and they also eat through turnips, potatoes, &c. No remedy known better than lime and soot, and effectual summer fallowings, which destroys them by depriving them of food.

TIMBER WORMS. The smaller kind merely eat into the sap of wood, and turn it into powder post, as it is commonly called. Felling timber about the middle of winter, the time it has the least sap in it, will obviate this difficulty. The large boring worm takes its residence chiefly in pine timber. They are hatched in the cavities of the bark, and being small when they enter the cavities of the wood, they grow larger as they proceed, till their boring may be heard at a considerable distance.

If the trees be scorched with a light flame, or washed, (Mr. Deane says steeped,) in salt water, it will destroy these worms, or prevent their entering the wood.

The same author says, that in 1770, formidable armies of worms overrun the county of Cumberland, about the middle of July, and stripped the vegetables of their leaves, leaving only the stems. They were extremely voracious, moved in apparent haste and all in the same direction, crawling over houses, &c. unless they found an entrance. Other parts of the eastern states have since experienced their ravages.

The best security found against them was to stop their course by trenches, having their sides leaning over, out of which they could not climb, after they had got into them.

HESSIAN FLY. As the ravages of this insect are confined to wheat, it is described, together with the remedy, in the essay on wheat.

MAGGOTS. Injurious to the roots of cabbages, and to turnips and radishes. Let the ground have a previous manuring with salt, which it is believed will be effectual; if not, let some brine, about as strong as sea water, be sprinkled once only about the plants, for if repeated it will probably be found hurtful to them. Or, perhaps, a better way is to apply a weak brine more than once, and that just after a rain.

YELLOW STRIPED BEG. This insect commits its ravages on the young plants of cucumbers, squashes, melons, pumpkins, &c. while in the seed leaf.

Water, made bitter by bruising tansy in it, and sprinkled over the plants, will keep off this insect; but this must be frequently repeated, particularly after rains. Green elder leaves are also very useful, either laid near the plants, or steeped in water and sprinkled on the plants. Soot, also, is very good, sprinkled on the plants while the dew is on, but must be repeated after every rain. Gypsum and ashes are also good for this purpose, sprinkled over the plants when the dew is on. Most, or all of these applications, to become efficacious must be repeated, with persevering diligence.

TURNIP FLY. This eats the seed of the leaves of the young turnip plants, and thus destroys them. One remedy is, to sow the ground thickly, partly with old and partly with new seed,

which will come up at different times, and thus a part of the one or of the other will stand a chance of escaping. Gypsum, soot and tansy water, applied as mentioned before is good. Elder leaves, frequently dragged over the ground after the plants are up, is also efficacious. Smokes, made to the windward side, will help to keep off this insect. Rolling the ground after sowing, is also recommended, where the ground is smooth: the benefit derived from this, consists in compressing the surface of the ground so as to afford fewer hiding places in it for these insects. It is said ducks, in a turnip field, will destroy the insects without injuring the young plants.

GARDEN FLEA. Destructive to young cabbage plants while in the seed leaf.

Remedy.—Elder leaves, gypsum, soot and tansy water, as mentioned above. Soap suds is also good to be sprinkled over them.

LICE. These infest cabbages, &c. They may be extirpated by smoke, particularly of tobacco. They sometimes, however, appear so late in the season that the frosts destroy them before they do much injury.

WEAVER. A little black bug, very destructive to wheat, either in barns or granaries. On thrusting your hand into a bin of wheat infested with them, considerable warmth will be felt; but as they are usually collected together, every part of the heap or bin should be examined.

It is said they may be destroyed in a close apartment, by fumigating it with burnt sulphur, for about twelve hours. Another *Remedy.* Mr L'Hommedieu, having found his bin of wheat full of weaver, he emptied the bin, white-washed the inside, and then returned the wheat into it, sprinkling a handful of fine unslacked lime over every four or five bushels, thus returned, and five or six handfuls was sprinkled over the whole. In ten or twelve days the weaver disappeared. When the wheat was used, he winnowed it, which took out the lime.

Weaver may be sifted out of wheat by a sieve, which will let them pass through, and retain the wheat.

GRASSHOPPERS. Great numbers of these are generated in upland mowing grounds. They are not so troublesome in upland pastures, for the reason, probably, that the feet of the cat-

to destroy many of them before they are brought forth. The only remedy known is said to be the keeping large flocks of turkeys and other poultry to feed on them; this is not, however, extensively efficacious, only when grass is appropriated to pasture.

CURCULIO. A genus of insects belonging to the beetle order. The species are said to be very numerous. The immense damage done, by an insect of this tribe to the fruits of this country, of which there is no similar account in Europe, has induced some naturalists to conjecture, that we have a peculiar and very destructive species in America. This insect injures and destroys our fruits by its mode of propagation. Early in the spring, about the time when the fruit trees are in blossom, the curculiones ascend in swarms from the earth, crawl up the trees, and as the several fruits advance, they puncture the rind, or skin, with their pointed rostra, and deposit their embryos in the wound 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 from so unsafe a residence, retreats into the earth: where, like other beetles, it remains in the form of a grub, or worm, during the winter, ready to be metamorphosed into a bug, or beetle, as the spring advances. Dr. Tilton says, that although these bugs have manifestly the capacity of flying, they appear very reluctant in the use of their wings, and perhaps never employ them, except when necessity compels them to migrate. Hence authorities differ on the subject of the best remedies. Some who suppose they crawl up on the bodies, would tie a rope dipt in tar, or make some other application to the bodies which would prevent their crawling up. But Dr. Deane, who thinks they use their wings to ascend the tree, believes, with many others, that they must be prevented from coming out of the ground, or destroyed in the maggot before they enter it. It is said that tanner's spent bark spread around the tree will prevent them.

As the smooth stone fruits are the grand nurseries of the curculio, special care should be taken to have these effectually protected. Unless this can be done, a farmer should not suffer them to grow on his plantation, as they will furnish a destructive vermin that will ruin his other fruits. Cherry-trees, nectarines, plums, apricots, &c. should therefore be planted in lanes and hard beaten yards, the common highways of all the stock of the farm, and not beyond the range of the ordinary do-

mestic fowls. In large orchards, care should be taken that the stock of hogs is sufficient to eat up all the early fruit which fall from May till August, as thereby the maggot, which is contained in the fruit which falls prematurely, is destroyed, and its ravages the ensuing year thereby prevented. Dr. Tilton says, that even horned cattle, and all sorts of stock, may be made to contribute to the preservation of our valuable fruits. By running among the trees they do not only trample to death multitudes of these insects; but by hardening the ground, as in lanes, it becomes very unfit to receive or admit such tender maggots as crawl from the fallen fruits.

It is very obvious, from the history of this destructive insect, that the health and preservation of either the seed or stone fruits is best promoted, by appropriating orchards to the keeping of either hogs or neat cattle, in the early part of the season, while the fruit is progressing to maturity.

PALMER WORM. This worm is about half an inch in length, with many legs and very nimble. They are seldom seen in great abundance except on apple and oak trees. They give trees the same appearance that the canker worm does. Dr. Deane says, he has never known them two years in succession in any place. Their ravages have no lasting effect. The history of them is so little known that no successful method of opposing their progress has been discovered. Dr. Deane observes, that as they let themselves down by threads they may be thinned by shaking the trees and striking off the threads.

THE GRUB and WIRE WORM. The following remarks on the grub* and wire worm may furnish some useful information, not only with respect to the most efficacious remedy against these insects, but all such as are found to originate from the egg of any winged insect, deposited in grass ground.

These insects are supposed to be the offspring of grass-hoppers, and other winged parents. These deposit their eggs in grass ground, where the young ones feed upon the roots, as the old ones had done upon the blades. Whenever, therefore, sward, or grassy land, for a spring crop, either for garden or field culture, is broken up, it should be recollected that these

* This name is, by some farmers, given to the black worm, which has been described, and to which the above remarks are intended to apply.

subterraneous feeders, as you have destroyed their natural stores, must now feed upon your plants, or perish. Fall ploughing will do much towards lessening their numbers; but in some instances enough will escape to injure materially the sprouts of Indian corn, and many other plants in your garden; they seldom if ever injure potatoes, beets or carrots, or do much damage to a crop of oats. It has been remarked by one writer, that whenever you have reason to expect these insects are in your flax ground or garden, sow the land with fine salt, broad cast, at the rate of two bushels to the acre. This will effectually destroy them, and as a manure, will more than repay the cost. This remedy, it may be observed, may be judiciously applied, when we have reason to conclude the egg, or larva, which produces the worm, has been deposited, or the worm so produced, actually exists in the ground from which you would raise any of those crops liable to its devastations. But the better and more certain remedy is, when circumstances will admit, to put the ground in such condition previous to committing your seed to it, that the grass-hopper, or other winged insect, will not probably deposit its egg therein; or if it is already deposited, to destroy its vivific principle. The surest way to effect this, is to plough it thoroughly just previous to the commencement of the winter frosts. And then early in the spring plough it again, and thus prevent every thing from vegetating until you commit your seed to the ground. With such management, the winter frosts will generally destroy the worm or the larva, that may have been deposited in the fall before; and as no green thing makes its appearance in the spring previous to the vegetation of the plant you wish to cultivate, the winged insect will seek some other place to deposit its egg; and before the worm thus produced becomes of sufficient magnitude and strength to injure it, the texture of the plant will probably become so firm as to withstand its attacks, and finally out-grow its ravages.

An antidote consistent with the interest of every farmer, or one who cultivates the earth, against the ravages of those insects which commit their depredations principally upon plants when in the first stages of their growth, is, to so fertilize the soil and prepare it for the reception of the seed, that it may vegetate rapidly and vigorously, that it may thereby the sooner acquire that strength and solidity which tends to fortify it, in some measure, against their attacks. Common observation will teach us that the more feeble and unhealthy the plant

when it first emerges from the surface, the more it will be exposed to the injurious effects of every species of insect to which it may be subjected.

PRACTICABILITY OF FERTILIZING THE BARREN PINE PLAIN LAND.

There are vast tracts of this land in different parts of the United States, the proprietors of which, either through negligences, or want of proper information, suffer to remain in a barren state, even after it has been cleared of its timber.

The question probably is, with many of them, how they can commence the process of tillage, so as to encourage them with a prospect of success to their labors, not having suitable manures to enrich it, or the means, as they may suppose, of providing them.

It is, however, very certain that such land have been in many instances converted into fruitful fields, and rendered highly productive. The modes of effecting this change in the state of these lands, has been discovered either by experiment, or from the science of those principles which govern the vegetation and growth of plants.

It is believed that this science, may now save the farmer the expence and time necessary, in making improvements on their lands, by experiment.

The difficulty in commencing successful operations on such lands, appears to arise from a supposed impracticability of effecting the growth of any green crop, whatever, in the outset, arising from the barrenness of the soil. But before an effort is made to overcome this obstacle, it is necessary to understand the nature and constituent properties of such soils; for notwithstanding there may be a uniformity in the complexion of their surface, it is certain that their constituent ingredients may be very different. As to the necessity of a knowledge of these, and the means of discovering them, the reader is referred to the essay on the nature and constituent properties of the soil.

Those lands of this description, which are so barren that no green plant whatever, is found on the surface, may generally, perhaps always, be supposed to consist of pure sand, or that which is nearly pure. Such lands cannot sufficiently retain moisture unless they have a close under stratum, consisting of some clay which may prevent the necessary moisture from escaping, before it can assist in the germination of plants. If such soils are situated upon a clayey bottom, which is within the reach of the plough, it should be brought up by the use of that instrument, and mixed with the sand. But if a mixture of clay cannot be provided from such means, if it is to be procured within a convenient distance, it should be carted on, spread on the surface, and pulverized in the first place, the finer the better.* This is done most expeditiously, and effectually with the harrow, and the roller.† When sufficiently pulverized it should be thoroughly mixed with the sand by ploughing and harrowing. When clayey earths cannot be procured in the vicinity of barren sands, compost manure, such as may be provided from the foliage of trees, or any other vegetable substances, in a state of decay, which may generally be procured from neighboring forests, ‡ if from no other source, carted on and mixed with the sand, or other barren soil, are a sure remedy against every defect which there may be in the soil; for although pure vegetable manure alone would furnish too much nourishment to the plant to render it productive, yet as it may be supposed to contain some particles of every necessary ingredient to the growth of a plant of which clay is considered one, it is the best substitute for that earth. There may, however, be instances in which either clay or vegetable substances cannot be procured without too much inconvenience and expense. In such cases there is an alternative which has been tried with success; that is ploughing in moist weath-

* The expediency of mixing clay with sand; and in what proportion to constitute a fertile soil, will be seen by referring to the analysis of the soil mentioned in essay on the nature and constituent properties of the soil.

† See essay on roller and rolling land.

‡ If any part of North America may be discovered to have barren sandy tracts of land, so extensive as to render it impracticable to procure either clayey earths, or vegetable substances to fertilize them, they may not be wanted for the purposes of tillage, within ten centuries to come.

er or when the dew is on. Let this be repeated, the oftener the better. This of itself, has been found to have brought into operation the vegetable principle.*

Gypsum, it is believed when spread on such lands as a top-dressing has been generally found efficacious to the growth of crops, in bringing into operation the vegetable principle, and often to become a substitute, in some degree, for the actual seeding with clover.

In common seasons some of the means above mentioned, it is believed, will be found efficacious in bringing such barren lands into a condition to bear a green crop.

If the soil can be prepared suitably in the spring so that a crop of spring or winter rye might be early sown, its fertility would be greatly increased by seeding it with either of those kinds of grain, and turning it under with the plough; say just before it heads. If some of the first green crops are not ploughed under, the farmer must, if he would increase, or even continue the fertility which he has thus effected, be careful to return all the straw, of whatever nature, which he carries off, for the purpose of manure, and the stubble which may remain after harvest, by being burnt on the land would add much to its fertility. This should be an invariable practice with all tillage lands, to restore to them the whole amount of the crop except the seed. It would not be best to attempt to take a summer crop of any culmiferous or legumenous kind as preparatory to a winter crop, until the land had become somewhat permanently fertilized.

When sandy, plain land is not entirely barren, but produces only some useless vegetable; paring and burning will produce fertility; that is, paring the surface to the deepness of one, two or three inches, gathering it into heaps and burning it, and spreading the ashes as manure, on the soil that remains. This is done in different ways, as has been thought expedient by different cultivators. Perhaps it might as well be cut up with a shallow furrow of the depth intended for burning, and after lying a few days to dry, scraped together in small heaps. This has been long practiced in Great-Britain, and many other countries; and been considered by many, as the most advantageous way of bringing in and improving, not only pine plain lands, but all soils, where the surface carried a coarse sward, and was composed of peat earth, or other inactive substances; being viewed as the best way of bringing them into action; the ashes

* See essay on improving land by ploughing.

furnished by the burning, serving as a stimulant to raise up their dormant powers, thereby rendering them fertile and productive in a superior degree, than could otherwise be accomplished.

The practice of paring and burning such lands should not be resorted to, when a green crop may be produced by other means, but only in extreme cases.

It appears that the improvement of barren lands by burning, was known to the Romans, who were excellent farmers. Virgil mentions it in the first book of the Georgics, and it is much practiced still in Great-Britain, and other places. "*Sape etiam steriles incendore profuit agros.*"* It would seem, however, that other barren lands where sand is not the principal constituent of the soil, might generally be burnt with more efficacy; because as the sand itself, it is said, is not improved, but rather impaired by the process, it cannot always be determined, without an experiment, whether the destruction of the inert vegetable matter, and the ashes produced from it, will compensate for the possible injury it may be to the quality of the sand.

Sir Humphrey Davy observes, that many obscure causes have been referred to for the purpose of explaining the effects of paring and burning; and believes they may be referred entirely to the diminution of the coherence and tenacity of clays, and to the destruction of inert and useless vegetable matter, and its conversion into a manure.†

Gypsum has perhaps been used with as much success, as any other means, in first producing a green crop of clover, or summer or winter rye, on such soils. But the great difficulty and expense incurred to obtain this manure, in many sections of our country, renders the use of it impracticable.

It should be remarked respecting the barren pine-plain land, as well as other barren soils, that when once a green crop of any description has been first made to grow upon them, the surest, and perhaps least expensive method of continuing and increasing their fertility, is to turn such crop under, as is directed in the essay on the culture of wheat. Such green crop may be that of buckwheat, rye, red clover, and some other of the artificial grasses, or perhaps other plants not valuable for any other purpose but manure. The efficacy of turning under green crops as a manure, has been so well attested, both by experiment as well as by the principles which govern the ger-

* It was often profitable also, to burn barren lands.

† See Sir Humphrey Davy's Agricultural Chemistry, No. 45.

mination and growth of vegetables, that any further remarks to establish the fact, would be useless, and when other sufficient quantities of efficacious manure cannot be had, this seems to be indispensable, on barren lands where green crops can be made to grow; and the barrenness of lands may be considered as justifying that measure, in all cases where the lands are so far destitute of fertility, that it cannot produce any valuable crop, as potatoes, beans, peas, &c. preparatory to a winter crop.

The remarks which have been made relative to the barren sandy lands, refer to those on which there has been known to have been a growth of timber, and have become barren by being left inactive, or by improper management. And as other tracts of land may be reduced to barrenness by the same means, it should be observed, that the same method should be used to preserve their fertility before they have become reduced, as are necessary to preserve it after they have been restored. The tracts of land of the latter description, are as yet probably the most extensive in our country. The owners of them should therefore be reminded, that whenever their productive powers are discovered to be on the decline, and cannot be kept in full vigor by any mode of tillage which their circumstances will otherwise admit, they should be stocked with clover, or other grass seed, and left to rot until their fertility is so far established as to admit of another course of tillage.

Those who doubt of the practicability of fertilizing the barren sandy pine-plain lands, on account of a supposed barrenness peculiar to the sandy earth, are referred to the essay on the nature and constituent properties of the soil, from which it appears that a much greater proportion of sand is admissible, if not an indispensable ingredient in constituting a fertile soil, than any other of the original earths, or of any one of the simple ingredients which are found efficacious in fertilizing the soil. Of sand, fifty-six parts of a hundred was found contained in a soil, as fertile, perhaps, as any in the northern States.*

The soil of the pine-plain land, when first cleared of the timber, is generally covered by a thick vegetable mould, which, when properly combined with the soil, usually produces, at first, a luxuriant crop. This is uniformly winter wheat. It is then planted for two or three years with Indian corn; then rye, oats, &c. are taken from it, until it becomes completely exhausted.

* See essay on nature and constituent properties of soil.

It is then suffered to lay two or three years, during which time it has probably been supposed it might regain, in some measure, its original strength, so as to sustain vegetation. But a different mode of culture has been found to be more correct, and pursued with success, not only with the pine-plain land, but with all lands, after having been newly cleared. Which is first a crop of winter wheat; second, Indian corn; third, barley, oats, spring wheat, or rye, with which grass-seed should be sown, (clover and timothy may be preferred) and the whole covered at the same time, either with the plough or the harrow. On the following season, the clover should be well plastered, especially if the soil is sandy, and the crop may be mowed for hay. The next season it would be well to give it a top dressing with plaster, and then may be fed until the latter part of August, or the beginning of September, at which time it should be turned over with the plough, and prepared for a future crop. It is well ascertained, both from experiment and the principles of vegetation, that only three successive crops should be attempted before the field be again seeded; and then the same rotation of crops may be pursued.

Under this culture, it is obvious that not only the pine plain lands,* but all others, may not only be preserved in their original fertility, but the quality, as well as the quantity, of their produce be improved and increased.

It is to be regretted that those lands have been often abandoned from an erroneous opinion that their soil would not admit of a successful cultivation; although it is a notorious fact that some of the most fertile and pleasant townships in the northern States consists of lands which were originally of the description of pine plains; but from the industry and wisdom of their occupants, have been rendered fertile and profitable.

* They are called pine plains, from the forest which they produce being composed principally of pine timber. But it is a fact worthy of remark, that when this timber is cut off, or destroyed by fire, it is usually succeeded by a luxuriant growth of several varieties of the oak, combined with the chesnut, and sometimes hickory.

MANAGEMENT OF A DAIRY.

To make a dairy profitable, the first thing to be attended to is, the quantity and quality of the milk. These depend much on the nature of the food with which cows are fed, though the former is often much affected by the manner of milking them. It is well, therefore, to be cautious in the choice of milkers. For, as has been well observed, if a cow be roughly handled, it is not only hurtful to her, but will also cause her to withhold her milk, which is often attended with unprofitable consequences. Where cows are skittish, they should by no means be handled roughly. If the udder be hard and painful it should be fomented with luke warm water, and stroaked gently, by which means she may be brought to a good temper, and to yield her milk freely.

If the fact was not sufficiently established by the dairy maid, it has been by chemical experiments, that the first milk which is drawn from the cow is serous, and that which succeeds is less so, and the last, or what are called strippings, is nearly all cream.

The portion of cream rising first to the surface is richer in point of quality, and greater in quantity, than that which rises in the second equal space of time, and so of the rest; the cream continually decreasing, and growing worse than the preceding.

Thick milk produces a smaller proportion of cream than that which is thinner, though the cream of the former is of a richer quality. If thick milk, therefore, be diluted with water it will afford more cream than it would have yielded in its pure state, though its quality will at the same time be inferior.

Milk carried about in pails or other vessels, agitated, and partly cooled before it be poured into the milk-pans, never throws up such good and plentiful cream as if it had been put into proper vessels immediately after it came from the cow.

From these fundamental facts it is observed in Doct. Anderson's valuable essay, that many very important corollaries, serving to direct the practice, may be deduced, among which are the following:

1. It is evidently of much importance, that cows should be always milked as near the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes; and as cows are much hurt by far driving, it must be a great advantage in a dairy farm to have the principal grass-fields as near the dairy and homestead as possible.

2. The milk drawn from each cow separately, should be put into the creaming pans as soon as milked, without being ever mixed with any other. The dairy maid would thus be able to remark without any trouble, the quantity of milk afforded by each cow every day, as well as the peculiar qualities of the cow's milk. By this means it would be easy to ascertain which of the cows it would be the owner's interest to dispose of, and which it would be best to keep and breed from.

3. To make butter of the best quality, it will be advisable, not only to reject entirely the milk of all those cows which yield milk of a bad quality, but also, in every case, to keep the milk that is first drawn from the cow, at each milking, entirely separate from that which is got last, as it is obvious, if this is not done, the quality of the butter must be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the quantity of the last drawn milk which is used, as it increases in richness to the very last drop that can be drawn from the udder at that time; so that those who wish to be very particular as to the quality of their butter, will do well to keep a very small proportion only, of the last drawn milk, for that purpose.

In that case too, they will give to calves which are designed for rearing, the first part of the milk instead of the last, as the practice of many farmers has been.

"Butter is found suspended in milk in the form of a white and liquid oil. This suspension is the effect of the saccharine matter and the curd, which are among the component parts of milk. In a state of repose and a cool temperature, this oily matter separates itself in a great degree from the serum, rises to the surface, and there forms a pelicle of greater or less density.

The formation of cream is a process of nature, which we best promote by giving to the dairies a northern exposition; by keeping them perfectly clean; because filth, besides other mischief, is predisposed to fermentation, and is, of course, productive of heat; and by forming the pans in which it is placed, so as to make them narrow at the bottom and wide at the top, that they may offer to the atmosphere the largest possible surface.

The separation of the butter from the milk, by churning, must be carefully and thoroughly performed. And for an invariable rule, it should be a moderate and continued agitation. If the

movement be too slow, or frequently intercepted, the effect intended is not produced; and if hurried and violent, the cream is too much heated, and yields a white and curd like butter. When this operation is well performed, the butter is found adhering to the staff and flyers of the churn; is of an agreeable taste and color, and of a certain degree of consistency.

The ordinary process of salting butter, is generally well understood by those who have the management of the dairy. It need only be remarked, that the salt employed for that purpose should be of the purest kind, well dried and broken down, but not completely pulverized: and should be so worked in as to become equally incorporated with the mass.

The following preparation however, is recommended by Doct. Anderson, which not only prevents the butter from becoming in any way tainted, or rancid, but also improves its look or appearance, while it imparts a sweeter and richer taste than could have been effected by the use of common salt only. Let two parts of the best common salt, sugar and salt petre, of each one part, be completely blended together by beating, and add one ounce of this mixture to every pound of butter, incorporate it thoroughly in the mass, and close it up for use. It will, however, be necessary to keep butter thus prepared for two or three weeks before it is used, otherwise it will not taste well.

But if properly cured, according to the directions above Doct. Anderson states, that it will continue so perfectly sweet for three years, as not to be distinguished from newly made and salted butter. The best butter is that made during the summer; but by adding a certain portion (which experience only can determine,) of the juice, expressed from the pulp of carrots, to the cream, previously to churning, winter made butter will acquire the appearance and flavor of butter that has been churned during the prime part of the summer season.

There are several modes, or variations, of making this important article of domestic consumption, the explanation of which would occupy too much of this limited work.

Those, of either sex, who may have the management of the dairy, will, after whatever may be said upon the subject, insist that it is the most important and the most difficult to procure the means of furnishing themselves with a competent supply of good milk for the purpose. But as the quantity desired cannot always be procured, it is an object of no small consequence to possess the science of making the most of it.

The following method of preparing cream, which is said to be peculiar to some counties in Great Britain, is too interesting to be unnoticed. The milk, when 24 hours from the cow, is put into a kettle over a slow fire, which should be hot enough to bring it very near to the boiling point in about two hours, and not less. A person, usually a child, is set to watch it, and the moment a bubble rises to the top, formed by the vaporized milk, the whole is taken off and set to rest for 24 hours more. At the end of this time, if the quantity of milk be considerable, the cream will be an inch or more thick upon the surface. It is now divided by a knife into squares of a convenient size and removed. The milk, remaining after the cream is taken off, contains little beside the watry particles in its original composition. The dairy women in those counties say, that milk thus treated, will yield one fourth more butter than is produced in the common way, and that a few strokes of the churn will form such cream into excellent butter. At present this cream is chiefly confined to the breakfast table: it is excellent for use with coffee, but when put into tea, it injures its taste, by being instantly converted, partially into butter, which rises to the surface. Cream, prepared as above, will keep somewhat longer than common cream.

It is said that the quantity of milk produced by cows fed by sainfoin, is nearly double to that of any other food. The milk is also much richer, and will yield a larger quantity of cream. The butter will also be better colored and flavored than any other. Parsnips are also easily raised, and will cause cows to produce abundance of milk, and they eat them as freely as they do oil cake or corn meal. For cows which are milked in the winter season, succulent food, as roots of some kind, should be provided, and there is none of more value than the parsnip.*

With respect to the making and preservation of cheese, there is much valuable science to be found in the Complete Grazier; from which a few remarks shall here be inserted.

The primary object in making good cheese is to have runnet well prepared. Dairy women usually preserve the maw, and the curd contained in it, after salting them, and then by steeping this bag and curd, make a rennet, to turn the milk for making cheese. But a more simple method, and which is equally good in every respect, is to throw away the curd, and after steeping it in pickle, stretch out the maw upon a slender

* See essay on gardening.

bow inserted into it, which will soon be very dry, and keep well for a long time. Take an inch or two of the maw thus dried, and steep it over night in a few spoonfulls of warm water, which water serves full as well as if the curd had been preserved for turning the milk. It is said that one inch will serve for the milk of five cows. An ingenious writer, who has made strict inquiry into this subject, recommends the following method of preparing a rennet, which has been found to be better than any other :—

“Throw away the natural curd, which is apt to taint and give the bag a bad smell; then make an artificial curd, or rather butter, of new cream, of sufficient quantity to fill the bag. Add three new laid eggs well beaten, one nutmeg grated fine, or any other good spice; mix them well together with three teacups full of fine salt; fill the rennet bag with this substance, tie up the mouth, lay it under a strong brine for three days, turning it over daily. Then hang it up in a cool and dry place for six weeks, and it will be fit for use. When it is used, take with a spoon out of the bag a sufficient quantity of this artificial butyrous curd for the cheese you purpose to make, dissolve it in a small quantity of warm water, and then use it in the same manner as other rennet is, mixed with the milk for its coagulation.”

But whatever kind of rennet the dairy woman may choose to prepare, it should be remembered, that this animal acid is extremely apt to become rancid and putrescent, and that great care is necessary to apply a sufficient quantity of salt to preserve it in its best state; because the rank and putrid taste, occasionally found in some cheeses, is owing to a putridity in the rennet.

The following mode of preserving it in a sweet state is practiced in some parts of England :—

When the rennet bag is fit for the purpose, let a strong solution of salt be made, with two quarts of sweet soft water, and add to this small quantities of almost every indigenous and foreign aromatics and spices that can be obtained. Boil the whole gently, till the decoction is reduced to three pints, over a clear fire, if possible, or at all events, so that it may not become smoky; next let the liquor be carefully strained, and poured in a tepid state upon the rennet bag. A lemon may now be sliced into it; and after the whole has stood at rest for one or two days, it may be strained and bottled. If well corked it will retain its goodness for a year, or even longer, and will communicate an

agreeable aromatic flavor to the cheese that may be made with it. When no good rennet can be procured, a decoction of the yellow flowers of the cheese rennet, or yellow lady's bed straw, *gallium verrem*, (which blossoms in July and August,) will answer every purpose for coagulating milk. Or the marine acid, in the hands of a judicious person may be used for this purpose, as is practiced in Holland.

There are different modes of making cheese practised by our dairy women, who have each of them much confidence in their own skill and science. It will, perhaps, best comport with this short work, to insert only an account of a single mode, practised in England, which seems to embrace the best and most generally approved views of this manufactory in the United States.

After the milk is brought to a certain degree of heat, (about 100 degrees of the thermometer upon the average, though in summer 90 will be sufficient, as on the contrary, during winter a higher degree will be requisite) it is poured into a large vessel, where the rennet is added to it, and which is closely covered up for a short time, perhaps ten or twelve minutes. If the rennet be good, it will have effected a coagulation of the milk, which is gently stirred, when the whey begins immediately to separate, which is taken off as it gathers, until the curd becomes tolerably solid. It is then put into a drainer, (a vessel made for the purpose, the bottom of which is perforated with small holes) and the cover of which is pressed down with any convenient weight. After it has thus stood for some time, and is pretty dry, it is returned into the first vessel, or dish, where it is cut into very small pieces by means of a cheese knife, (which is furnished with three or four blades, fixed on prongs from the handle, that cut in a horizontal direction) it is then salted, and properly mixed by the hand. Lastly, it is put into a cheesitt, or stout dish with iron hoops, which has a cover that goes exactly into it: a cloth being placed between the curd and the vessel. In this case it is submitted to the action of the cheese-press, when it is occasionally taken and wrapped in dry cloths, till it has completely parted with the whey: when this is suspected to be the case, the cheese is laid aside for one or two days, when it is again examined: and if there be any appearance of whey remaining, the pressure and application of cloths are repeated. As soon as it is ascertained that the whey is extracted, the cheese is laid out on boards made for the purpose, (and which are, or

should be, of the same breadth as the cheese) or on a deal, or pine-wood floor, or boards, as well as to notice whether any whey runs from them, because no cheese will keep well while any whey remains. Besides, if that part sours, the whole cheese will acquire a disagreeable flavor and smell; or if any immoderate quantity of rennet be used, it will produce similar effects, and also blow up the cheese full of small holes; which last effect will also result from suffering the cheese to continue too long on one side. After the cheese is cured, various modes are adopted in polishing them for sale, which are often rather injurious than beneficial; nothing farther being requisite, besides turning them; than to rub them occasionally with a coarse cloth, especially after harvest, because at that time they tend to breed mites.*

Some general remarks must close this essay.

Throughout the system of the dairy management, the vigilant eye of the principal ought carefully to pervade; as it rarely happens that servants are to be found who will give that minute attention to every particular, which is so indispensably necessary, to insure success. On this account, it is more likely that a dairy farm of moderate size, one for instance that will keep ten or twelve cows, will, if well managed, afford more profit than one of greater extent; because in the former case, the farmer's wife (and daughter, if he have any) can more easily superintend, or perhaps perform, a considerable part of the dairy operations themselves; and this is always better done by them than we can ever expect it to be by hired servants. No branch of husbandry requires such unremitting attentions. If, as has been very justly remarked by Sir John Sinclair, a few spoonfulls of milk are left in the udder of the cow at milking; if any one of the implements of the dairy be allowed to be tainted by neglect; if the dairy house be kept dirty, or out of order; if the milk is either too hot or too cold at coagulating; if too much or too little rennet is put into the milk; if the whey is not immediately taken off; if too much or too little

* Farmer's Magazine, vol. iv. p. 381.

salt is applied ; if the butter is too slowly or too hastily churned ; or if other minute attentions are neglected, the milk will be in a great measure lost. If these nice operations occurred only once a month, or once a week, they might be easily guarded against ; but as they require to be observed during every stage of the process, and almost every hour of the day, the most vigilant attention must be kept up throughout the whole season. That is not to be expected from hired servants. The wives and daughters of farmers, therefore, having a greater interest in the concern, are more likely to bestow that constant, anxious, and unremitting attention to the dairy, without which it cannot be rendered profitable.*

POULTRY.

THE advantages which the farmer may derive from keeping poultry, may depend in some measure on his local situation. In the vicinity of large towns, or cities, they may be made a profitable source of income ; and in every situation in the country, though one may have the occupancy of no more land than is sufficient for a garden, the keeping of a few fowls will furnish some of the necessaries, and even luxuries of life, at but little expence. Indeed, an actual advantage is derived to the owner by the destruction of various insects, which constitute at least, a part of their food a great proportion of the year.

* There is not a more nutritive food, of the same expence, than the eggs of the dunghill fowl.

* See the Complete Grazier.

The following singular experiment, respecting the fattening of poultry, is from the National Recorder. In the winter of 1818, a gentleman in the city of New-York placed a Turkey in an enclosure about four feet long, two feet wide, and three or four feet high. He excluded as much light as he could without a circulation of air, and fed the turkey with soft brick broken in pieces, with charcoal also broken, and with six grains of corn per day. Fresh water was daily supplied. The box, or coop, in which the turkey was placed, he always locked up with his own hands, and was perfectly confident that no body interfered with the experiment. At the end of one month the turkey was killed, and was found to be filled up with fat. The gizzard and entrails were dissected, and nothing was found but a residuum of charcoal and brick. The Turkey was eaten and found to be very good. The next year he repeated the experiment with the same success.* This is not mentioned as a matter of so much importance to the farmer, who generally has other food in plenty for his poultry; but it is an instance of the efficacy of chemical science, in the development of facts which may be of great importance in the improvement of agricultural and domestic economy.

It may, however, be an object of no minor consequence to the poorer class of our citizens, to know, that in exigences of extremity, they may save their little stock of poultry by raking from their ashes the remnant of charcoal.

It is observed in the Complete Grazier, that a spirited farmer near Liverpool, keeps a large stock of poultry in the same inclosure, with singular success. He has nearly an acre enclosed with a close slab fence, about seven feet high. The top of the fence is every where sharp pointed, like pickets, though perhaps this is not necessary. Within this enclosure are put up slight small sheds, well secured from rains, however, for the different kinds of poultry, and it is supplied with a small stream of water. The poultry are regularly fed three times a day with boiled potatoes, which is their only food, except what grass may grow within their enclosure. The dung

*The farmer, or other citizen, unacquainted with the science of chemistry, will not think this account so incredible, when they are informed, that carbon is the basis of charcoal, and that carbon is a necessary part of sugar of oil, &c. and consequently enters into the composition of animal milk, and of animal oils and fat. See Parker's Chemistry, p. 270.

of the poultry, which is exceedingly rich, is carefully saved for use; and the turf of the enclosure is occasionally pared off for mixing with composts. This might be a profitable employment in the vicinity of large towns, and a proper measure to be practiced upon a smaller scale, by gentlemen who live in villages or compact settlements, where fowls are continually trespassing upon each others enclosures, though it is believed it would be better to keep the different kinds of poultry separate when practicable.

Of the dunghill fowls, as they are usually called, there are various breeds, which it is perhaps unnecessary to designate.

A good hen, of this description, has been found to produce from one hundred and fifty to two hundred eggs in the season, if well kept, and if her eggs are not taken from her, may bring forth three broods of chickens, and by careful management about eight grown chickens may be raised from each brood.

Guinea fowls lay many eggs in the course of the season; but as they are in the habit of wandering, their eggs are not easily found. Their flesh is of but little value. The black turkey is the most hardy of this breed of fowl. The young ones however are tender and apt to die. The Swedish method of making them hardy is to take them as soon as they are hatched, or as soon thereafter as they are found, and plunge them into cool water, or force each one to swallow a pepper corn. After this, it is said, they are subject to another fatal malady; to remove which when any of them are found drooping, pull out such feathers of the tail as are filled with blood, and the chickens will presently recover.

This fowl is profitable to be raised in many conditions, of those who live either in villages or on a farm, and are of great use in destroying insects, particularly grasshoppers. The turkey has been said to have derived its name from the country from whence it has been imported; though it appears to be the same with that which runs wild in the interior of our country.

Geese generally breed but once a year, but frequently twice if they are well kept. It is said, to succeed in raising this fowl, three geese should be allowed but one gander; and if

the number be increased, the eggs will usually be rendered abortive. While brooding, the goose should have corn and water placed by her, and the gander at this time should have free access to guard her. The nest should be sufficiently high round the sides to prevent the eggs from rolling out, as they are turned by the goose every day. Some practice breaking the egg slightly near the beak of the young goslin, when they are about to make their way out. It is an object of considerable importance to raise this fowl for the profit of its feathers. Although the plucking them so often as is the practice of some, yet it is said they thrive better by repeated pluckings, than where they are permitted to shed their feathers in the natural way, which is at the time of moulting. In a part of Great Britain where they are raised in the greatest numbers, they are plucked five times a year. Their flesh when well fattened is preferred by some to that of the turkey.

The varieties of tame ducks are the same as the wild. They begin early to lay their eggs, and produce a considerable number, which are nearly as good as the dunghill fowls. About twelve is said to be a proper number for the ducks to set on. They are greedy feeders, and not particular as to their food. They are fond of animal food, and are quickly fattened upon it. They are useful in turnip fields, to destroy the insects which are apt to prey upon the young plants. They should have access to a supply of running water.

It is believed by some that poultry is most easily fattened when kept in a dark place, and fed on boiled grain.

IMPROVEMENT OF BOG MEADOWS.

Those bog meadows which are to be found in almost every section of our country, if so situated as to admit of draining, may make very valuable lands. In some parts of the northern states, they are said to exceed almost any others for raising hemp. Great crops of herds-grass may also be raised upon them. But they must be well drained; the drier they are laid the better.

The method recommended, for draining these lands, is, first to run a ditch through the middle, and draw off as much of the water in this way as possible. When the meadow is very wet and miry, you commence at the lowest part of the ground, where the outlet is to begin, and from thence carry the ditch into the meadow, sinking it all the way, as you proceed, as low as will barely give the water a current to run off; a ditch should then be run, of the same depth, all round the edge of the bog, for the purpose of cutting off all the springs. Cross ditches should then be made, in number and size, proportionate to the extent of the bog, and of the depth of the middle and surrounding ditches. When the mud, taken from the ditches, is carted on to dry gravelly and sandy land, it makes excellent manure; and gravel and sand is equally beneficial, too, as a manure for bog meadows.*

Potatoes, cabbage, carrots, beets, turnips, parsnips, and even corn, and almost every grain, except wheat, have been cultivated to great advantage on well drained bog lands, when well manured with upland earths. Hops, also, are cultivated to great advantage on these lands.

When the farmer discovers that there is but a thin layer of bog dirt, situated on a deep clayey bottom, it, perhaps, ought to deter him from the expense of draining the swamp, especially if it be covered with a thrifty growth of timber. Because situated as such clayey bottoms are, so contiguous to the surrounding wet lands, it would probably always retain too much moisture, to admit of the successful tillage of any soil that might be made on the surface.

It should be remembered that bog lands will settle down very much after draining, for which a proper allowance should be made with respect to the depth of the ditches.

* See essay on manures.

FLOODING LAND.

This may be done by covering low lands with water, when a rivulet passes through them, by making a dam at the outlet. Where there is a sufficiency of water, and a short dam will answer, this is a piece of husbandry that ought not to be neglected. Oftentimes it may be of great advantage. Sometimes it is done for the purpose of destroying the natural growth of trees, bushes, &c. The water not only makes an essential alteration in their food, but also excludes these from the free air, which is essentially necessary to vegetation. It is no wonder therefore, that it proves their destruction.

The flowing of two summers, is found sufficient to kill every plant of the woody kind, so that it will not sprout any more. But some advise to draw off the water in August, that the ground may be for a few days heated by the sun. The plants thus suddenly pass from one extreme to another, which will doubtless tend to destroy them the sooner. But when the season is so dry that another pond of water cannot be immediately raised, the drawing off had better be omitted. Another object of flooding is to enrich the soil. Some lay their low grass lands under water during the whole of the winter. This may be a good method for lands which are so low and wet, that none of the best grasses can be made to grow on them. The poor water grasses will grow the faster, and the crops of such hay as it is, will be the larger.

But places where clover, or herds grass, or red top will flourish, should not be flowed during the winter; because the winter frosts are known to be necessary to the production of those grasses.

Flooded lands should always be laid bare early in the spring, that the growth of the grass be not prevented; or that the

ground may be dried so early as to be fit for tillage crops. And ditching flooded lands, at least round the borders, will be necessary to lay them dry enough for tillage.

As standing water catches dust from the atmosphere, and always contains more or less of the finest particles of soil, it deposits a rich sediment; a fat slime therefore, will remain on the surface after the water is removed. And a time should be chosen for drawing it off, when the air is calm, and the water clearest, that as little a quantity as possible of the food of the plants may pass off with it. Such land is no more liable to suffer by drought than the fertile land of Egypt, which is yearly enriched by the overflowing of the Nile.

Though winter flooding does not suit the nature of good grasses, a few days flooding in the spring and fall will not hurt them, but will enrich the soil and so promote their growth. The soil will have the same advantage as *intervale*, which is made rich and fruitful by occasional flooding; and even a greater advantage, as the water may be removed and applied at pleasure."

THE HORSE-RAKE.

A horse-rake may be procured at an expense not exceeding two dollars. It is constructed thus: Take a stick of timber, of any stout wood, ash, chessnut, fir, or spruce, will be sufficient, ten feet long, if your mowing lands are free from obstructions, and if obstructed with stumps or rocks, then shorten the head of the rake to your convenience. The rake-head may be three and a half inches by two and a half diameter, or as you please. The teeth should be twenty-two inches long, and one inch by one inch and a half diameter, and set firmly into the head, about two inches and a half apart. These teeth may be made of firm white ash, or walnut, or oak. The teeth should be made at the end to turn up, so as to run on the ground like a small sled, and not into the earth. On the top of the head should be fixed about seven small standards, eighteen inches high, to prevent the hay falling over the head. In the centre of the head fix two handles, such as are usually fixed to ploughs, at a suitable distance, to guide and steady the rake. From the ends of the rake extend a rope of the size of a cart rope, to fasten the horse's collar. The distance of the horse from the rake may be such as to leave room for the hay to gather. Observation will soon direct the length of the ropes. Care must be used to have the teeth set even and firm, that they may run near the earth. This rake may be used to collect the hay into winrows, or pile it up into heaps; and it is useful in all grain fields, to glean the scattered grain, and to lay down the stubble close to the earth, to rot and promote vegetation.

This rake may be considered a labor-saving machine, and is particularly useful, when the place of deposit for your hay is in the same field where the grass is cut, whether it is to be stacked or put into a barn; as you can then gather large piles out of the winrow, and draw them direct to the place of deposit at one and the same operation, thereby saving the once pitching of your hay.

It is said by one who is acquainted with this machine, that it will enable one man, with a steady horse and boy, to perform at least as much work in gathering hay into winrow and pile, as six good men can accomplish, and as clean as is commonly done in raking by hand.

Those who occasionally cut grass for hay on smooth tillage ground, or have smooth meadows, will find this implement worthy of their attention.

HARROWS, AND HARROWING.

The three-square harrow is in most general use, and believed to be best; it should be longer and narrower for stony or stumpy ground, and wider where the ground is smooth. It is essential for a good harrow to have long heavy teeth, made of iron, and pointed with steel at the end. When the land is rough, there ought to be fewer teeth than where it is smooth. The teeth of the harrow, for rough ground, ought to be set slanting a little backward, to prevent its getting fastened by the stones, roots, and stumps; and on the contrary, where it is used for smooth ground, they ought to be set slanting considerably forward.

Harrowing on wet ground should be performed in a dry time, and in the middle of the day, when practicable. On dry lands it is best to harrow in the morning while the dew is on, and when the ground is moderately dry.

The ground should be harrowed before seeds are sown; otherwise they will be buried of unequal depths, and will come

up in rows; as most of the seeds, in that case, will be thrown into the bottom of the furrow. On furrows of green sward turned under, the harrow should be loaded with more than its common weight, and run length-ways with the furrows. When the seed is sown on ridges, the harrow ought also to run length-ways. Harrowing meadow lands, when they become bound, or become cold and mossy, is often of essential service to them, and will make them produce much more abundantly the following years; though when circumstances will admit, breaking such lands up with the plough, as is directed in the essay on improvement of land by ploughing, is preferable.

Harrowing wheat and rye in the spring is considered by European writers to be very beneficial; but this must depend on the condition of the land. It might be useful if the grain was obstructed with such kind of grass or weeds, the growth of which would probably be retarded or defeated by the operation.

The double harrow, or two three-square harrows, the one inside of the other, is believed to be an improvement on the common harrow. To make this, let the two outside pieces be six feet six inches long; the tongue, or middle piece, five feet six inches; the inside pieces, four feet long; the sheath, or cross piece, one inch thick by four inches wide; the rest of the timber three by four inches square; the hind part of the harrow, six feet six inches wide, from outside to outside; and to contain nineteen teeth. It is very obvious that such a harrow will more completely pulverize the ground, than the ones most commonly in use.

It should always be considered that the condition of the soil may be such as to require the harrowing to be deeper for some purposes than others. If, for instance, you have ploughed in dry compost manure, with a shallow furrow, in that case your harrow teeth should not be permitted to penetrate so deep as to uncover it: To be rendered most efficacious, it should all remain covered by the soil. So also some seed should be covered deeper than others. Hence it is obvious

that it is expedient for the farmer to have ~~thin~~ pieces of wood, or slit-work, of different widths, at hand, to be placed on the top of the harrow, with holes, through which the teeth may be placed, to prevent their penetrating deeper than the condition of the soil, or the nature of the crop may require.

THE PLOUGH.

We are indebted to the proper and efficacious use of the plough, for the advantages of agricultural science, and the blessings of civil life. A knowledge, therefore, of its best construction and management, is indispensable. There is indeed no other means of avoiding the errors and impositions of visionary and speculating projects relating to this important implement, but by adopting certain correct and practical principles relating to it.

The great points to be attended to in ploughing, are, 1, to open a fair, regular furrow; and 2, to do this with as little resistance as possible. It has been believed that these advantages may as well be obtained by the use of a plough to which the mould board invented by Thomas Jefferson, is affixed; the following account of which, and of the principles upon which it is constructed, are taken from a communication addressed to Sir John Sinclair, in 1798, then President of the British Board of Agriculture, and inserted in the Transactions of the American Philosophical Society, 4th vol. "The mould board should be a continuation of the wing of the plough-share, beginning at its hinder edge, and in the same place. Its first office is to receive

the sod horizontally from the wing; to raise it to a proper height for being turned over, and to make, in its progress, the least resistance possible, and consequently to require a less force in the moving power. Were this its only office, the wedge would offer itself as the most eligible form in practice. But the sod is to be turned over also. To do this, the one edge of it is not to be raised at all; for to raise this would be a waste of labor. The other edge is to be raised till it passes the perpendicular, that it might fall over of its own weight. And that this may be done so as to give also the least resistance, it must be made to rise gradually from the moment the sod is received. The mould board then, in this second office, operates as a transverse, or rising wedge, the point of which sliding back horizontally on the ground, the other end continues rising till it passes the perpendicular. Or, to vary the point of view, place on the ground a wedge of the breadth of the plough-share, of its length from the wing backward, and as high at the heel as it is wide: draw a diagonal on its upper face, from the left angle at the point, to the right upper angle of the heel; bevil the face from the diagonal to the right bottom edge, which lies on the ground. That half is then evidently in the best form for performing the two offices of raising and turning the sod gradually, and with the best effect; and if you will suppose the same bevil continued across the left side of the diagonal, that is, if you will suppose a straight line, whose length is at least equal to the breadth of the wedge, applied on the face of the first bevil, and moved backwards on it, parallel with itself and with the end of the wedge, the lower end of the line moving along the right bottom edge, a curved plane will be generated, whose characteristic will be a combination of the principle of the wedge in cross directions, and will give what we seek, the mould board of least resistance. It offers to this great advantage, that it may be made by the coarsest workman, by a process so exact, that its form shall never be varied a single hair's breadth. One fault of all other mould boards is, that being copied by the eye, no two will be alike. In truth,

it is easier to form the mould board I speak of, with precision, than to describe that method, either by words or figures.

The following rules for constructing a plough are from a Pennsylvania farmer:—In constructing ploughs, the beam ought to be placed directly over the land side of the plough, so that the cut of the coulter may be square with the cut of the share; and the land should be given to the plough between the coulter mortise and the fore end of the beam: for if the cutting of the share and coulter makes an acute angle with the land, then the plough will incline to fall to the right; but if it makes an obtuse angle, then it will incline to fall to the left. A plough for two horses ought not to be less than nine inches, nor more than ten inches wide, in the bottom; and for three horses, from eleven to twelve inches wide. The share should never differ much in width from the plough. The cut of the share and bottom of the plough should be exactly in one plane. A three-horse plough requires no land in its construction. A crook of three inches and a half in the beam, before the coulter mortise, to the right, will suffice for the land of a two-horse plough. A plough with a long beam runs the steadiest, and it being long prevents the plough from kicking; and long shafts give the ploughman a greater command of its direction. The cast iron plate ought to be scoured with a grit-stone before it is used.

PLOUGHING.

In the essay on improvement of land by ploughing, some remarks have been made on the proper manner of performing that operation. Although it is believed that the soil may be fertilized by repeated ploughing, yet much will depend on the manner in which that process is executed. No land, excepting green sward, should be ploughed when it is so wet that it will not easily crumble. The principal design of ploughing is to break the cohesion of the soil, and so loosen the particles from each other, that the smallest and tenderest roots of plants may find their way between them in quest of their nourishment. Neither should land be ploughed when the furrow turns over like a dead mass of mortar; as the soil becomes no lighter or looser by it, but rather heavier and more compact. On the contrary, land should not be ploughed when it is too dry, as the furrows in that case cannot be so well turned over, and it requires the more strength of team to perform it.

Green sward land may be ploughed at any season of the year, if it be not too dry, nor too much frozen.

The English farmers practise ploughing green sward in January, not only because they have leisure, but because it is so wet as to plough easily. They call it ploughing in lays; and it is said to be well performed, when the sward is all completely turned over, without lapping one furrow on another.

Our farmers are sometimes led to plough too shallow to save a little labor. And some are too much afraid to turn up what they call dead earth. But it is believed that all the soil above the hard pan may be well employed in tillage for some crops or other; and that if they turn up a red soil, it will in a year or two become dark, and fit to nourish plants, by being exposed to the sun and to the weather, and imbibing rich particles from the atmosphere.

French ploughing is sometimes practised to advantage ; and the culture of some plants with tap roots requires it. This is done by passing a plough twice in a furrow. Ground may be thus ploughed to the depth of twelve or fifteen inches. But instead of this double labor of the plough, where laborers are plenty, the furrows may be deepened with shovels, by a number of hands following the plough.

In old countries, where lands have been tilled for many centuries, and have been frequently manured, the rich black soil has been growing deeper and deeper, so that trench ploughing may be very necessary, to bring up the strength of manures, which has subsided to a greater depth than common ploughing reaches. Where this practice is once begun, it should be continued, at least through a course of tillage ; or else the first ploughings will be in some measure lost. The best of the soil would be buried at such a depth as to become almost useless, unless it were alternately brought near the surface, by after ploughings equally deep.

Green sward ground that is broken up in the fall, is usually cross ploughed in the spring following. But this should not be done without caution. For if the turf be not considerably rotted, cross ploughing will only drive it into heaps, instead of cutting it to pieces. Neither will the harrow reduce the turf to powder. In this case it would be best to omit the cross ploughing : and after a heavy harrowing lengthwise of the furrows, seed the land with peas, potatoes, or maize, or any thing that will do well with such culture.

For a crop of winter wheat, the tillage ground should be ploughed in the spring, again in June, and lastly just before sowing. Neither should this practice justify the omission of ploughing the same ground the preceding fall, before the commencement of the hard frosts, which should always be done when circumstances will admit.

Whatever manure is put on, it should be done just before the

last ploughing, and ploughed in immediately. If the grain be ploughed in with a shoal furrow, it will not be so liable to be killed by the winter frosts. The roots will lie deeper than those of harrowed grain, and will the better bear drought in the following summer, if that should happen.

Some, to save labor, plough their lands so shallow for sowing as scarcely to take up the roots of the weeds. This is believed to be bad husbandry: for in that case a larger crop of weeds may be expected, than if it had not been ploughed at all; and that the roots will not have sufficient room to extend themselves. Ploughing the ground in autumn will have a tendency to prevent this most absurd conduct in the spring, which some practice to favor their teams in the faint season.

Land that is low and flat, and therefore apt to be too wet and heavy, ought to be ploughed in ridges. The ridges may have two, three, or four furrows on each side, according as the ground is wetter or drier. The wettest ground should have the narrowest ridges; but they never should be narrower than four furrows in a ridge. The rows will be between four and five feet apart, if one row of plants be set on each ridge. But if there be six or eight furrows in a ridge, it may admit of two rows, one on each side of the veering.

After lying in ridges through the winter, the ridges should be thrown into the hollows by another ploughing in the spring, which will bring it into good order for seeding. Or, if it should be too miry to be ploughed in the spring, either Indian corn or potatoes may be planted on the ridges; and what is wanting of the proper tillage, may be made up after the ground has become drier, by frequent and deep horse hoeings. Good crops of corn, it is said, have been obtained in this method, on land which, with plain ploughing, would have produced next to nothing.

Most clay soils, which lie level, require this sort of culture, for this more than any other soil is liable to be injured by overmuch wetness. And the drier it lies, the weaker will be the cohesion of its parts.

Some soils, which lie gently sloping, are so wet as to need ridging. It is not best to make the ridges directly up and down the slope, nor horizontally, but on a medium between both. But when the land will admit of it, the ridges should lie north and south.

It is no bad practice to lay lands to grass in ridges or beds. For too much wetness is apt to hurt grass lands, as well as lands for tillage, whether they are used for mowing or pasturage. In the former the grass will be too sour to make a good hay; and in the latter, not only the grass will be bad, but the soil so soft as not well to bear the tread of cattle. It has been found that better grass and a greater quantity may be produced in this way. Nor will the soil so soon become hard and bound.

It is practised by some to split the hills with a light plough, in autumn, after a crop of corn; even though the ground be not seeded till the following spring. One side of a row of hills is ploughed off with one furrow, and the other side ploughed off the contrary way by another furrow, so as to form moderate ridges in the intervals. It is performed with less than half the expense of plain ploughing; and nearly the whole of the surface is either taken up or covered. It has been said by European writers, that land should be ploughed immediately after a crop of corn, to prevent the stubs from robbing the soil of its juices. However this may be, the ploughing is perhaps as useful as other autumnal ploughings; and where dung has been put in the holes, it mixes it with the soil; not to mention the burying of some of the stubs and leaves of the corn, which will contribute something towards enriching the soil.

The following maxims respecting the proper depth of ploughing are from the *Code of Agriculture*:

1. The depth to which land ought to be ploughed, must first be regulated by the depth of the soil. On these soils, more especially, on a rocky substratum, the ploughing must necessarily be shallow.
2. The depth ought likewise to depend on the means of im-

proving the soil : for when the land is poor, and the means of enriching it are scanty, the depth of ploughing ought to be in proportion to the quantity of manure which can be obtained.

3. Deep ploughing is highly advantageous upon every soil, excepting those where the substratum is of an ochry sand. In fact such are scarcely worthy of being cultivated, unless in situations where much alluvial compost, or common street manure can be procured.

4. It is a general rule, never to plough so deep as to penetrate below the soil that was formerly manured and cultivated, excepting upon fallow, and then only when you have plenty of lime or dung to add to and improve the new soil.

5. Many farmers recommend, when fallowing land, to go as deep as possible with the first furrow, by which the subsequent furrows will be more easily done ; and to expose the soil to the winter's frost and the summer's heat. But when the land is ploughed in spring, for a crop of oats, a strong soil cannot be ploughed with safety above five or six inches.

Deep ploughing is advisable on moorish cold soils, as it affords a greater scope for the roots of plants to procure nourishment, admits the superabundant moisture to subside from them, and prevents the summer droughts from making any injurious impressions on the growing crops ; for, on such lands, shallow ploughing exposes vegetation to be starved or drowned in wet weather, and to be scorched or withered in dry.

7. It is unnecessary to plough deeper, when the seed is sown, than where there is a fair probability of the different kinds of plants sending their roots ; and as beans, clover and turnips, the only tap rooted kinds usually cultivated in this country, seldom send their shoots above seven or eight inches down into the soil, and the culmiferous species not so far, it is probable from these circumstances, that from seven to eight inches may be deep enough for all the purposes of ordinary culture. Occasionally, however, ploughing even ten inches, in the course of a rotation, during the fallow process, is advisable.

Deep ploughing is not to be recommended, 1, When lime or marle has been recently applied, as they have such a tendency to sink, from their weight, and the moisture they imbibe : 2, When turnips have been eaten off by sheep on the land where they were grown : 3, When grass, only two or three years old, more especially when it has been pastured with sheep, is broken up ; because owing to the extreme condensation of the soil, by the trampling of the sheep, a furrow, even of a moderate depth, to appearance, will make the plough penetrate below the staple that has had been cleared, by the culture given during the previous fallow."

The advantages of deep ploughing, according to the same writer, are, 1, Bringing up new mould, which is peculiarly favorable to clover, turnips, beans, and potatoes ; and indeed without that advantage, these crops usually diminish in quantity, quality and value. Deep ploughing is likewise of great consequence to every species of plant, furnishing not only more means of nourishment to their roots. but above all by counteracting the injurious consequences of either to wet, or too dry a season. This is a most important consideration, for if the season be wet, there is a greater depth of soil to absorb the moisture, so that the plants are not likely to have their roots immersed in water ; and in a dry season, it is still more useful, for in the lower part of the cultivated soil, there is thus a reservoir of water moisture, which is brought up to the roots of the plants, by the evaporation which the heat of the sun occasions. 3. By deep ploughing, animal and vegetable manures, which have such a tendency to rise to the surface are properly covered. This cannot be done by shallow ploughing, in consequence of which much of the value of such manures is lost : 4, By deep ploughing a heavier crop is raised than can be got from a shallow furrow. An intelligent farmer, after pointing out that deep ploughing increases the staple of the soil, keeps the roots of the corn from being injured by wetness, and also enables the crop longer to resist the drought, adds, I have ever found deep ploughing attended with great

crops, when ridges, shallow ploughed in the same field, were but indifferent," which seems a decisive proof in favor of deep ploughing.

WEEDS.

Weeds infest all kinds of land more or less, and occasion so much labor that it is seldom perfectly accomplished. But there are various considerations to induce the farmer to do all in his power to suppress their growth. 1. Whenever weeds are suffered to stand and grow among cultivated plants, the crop will receive proportionably the less quantity of nourishment from the earth; for they require as much nourishment from the earth as better plants do. 2. Their roots occupy and fill many of those interstices in the soil, which would have been occupied by the roots of the cultivated plants; and many kinds of weeds have such a multitude of strong and binding roots, that they render the soil stiff and hard, and so compact that the roots of tender plants cannot extend themselves in it. This bad quality is possessed in a remarkable degree by the quitch grass, and by some other weeds. 3. Weeds prevent plants from tillering, or branching out from their roots, as many kinds, and particularly the farinaceous, which are the most valuable, are inclined to do when they have room. But the growing of a multitude of weeds among them, reduces them to a crowded situation; the consequence is, that they shoot up only single stalks, by which means the crop is greatly diminished. 4. Weeds deprive plants of that free circulation of air

about them which is necessary to their being in a healthy and vigorous state. For this reason they run up slender, and remain of a loose and spongy contexture, and bend down and lodge by their own weight, unless the weeds happen to be so strong as to hold them up. 5. Weeds, besides the general evil of taking away the food of plants, rob the soil, particularly of its moisture, and speedily reduce it to such a dry state, that neither weeds nor other plants can receive from it any vegetable food, for want of that proportion of moisture which is necessary to give it fluidity. Accordingly it is observable that the abounding of weeds brings on an early appearance of drought; and some weeds of the creeping kind twine about the plants in such a manner as to prevent their growth, and the circulation of their sap. Others shade them, and shut out the direct influence of the sun; while others, the dodder in particular, it is believed, draw their nourishment directly out of the bodies of plants, by sticking their fibres into them, and thereby cause them to decline.

So many and great are the mischiefs done by weeds, that when they are suffered to grow unmolested among useful plants, whatever culture may have been bestowed to prepare a crop, is, in a great measure lost, and the seeds wasted.

With a view to investigating the best means of subduing, or destroying weeds, we should consider them as divided into, two classes; those which chiefly infest lands that are in tillage, and those that prevail in our grass land; and how to prevent the existence or prevalence of them.

When it is necessary to make use of new dung, or such as may contain the seeds of weeds, it should be applied to hoed crops, in preference to others, in the tilling of which, the weeds will be destroyed as fast as they rise during the summer. But it is best to avoid carrying seeds on to other tillage lands when practicable, while they retain their germinating principle. No dung or compost manure should therefore be applied to the soil, until it has undergone such fermentation in heaps,

as to allow opportunity to destroy the vegetative quality of all the seeds that are contained in it. Therefore, it is advised that heaps of manure, intended for sowed fields, should be shovelled over two or three times in a summer; by which means, most, or all of the seeds contained in the heaps, will vegetate and be destroyed. But when land is laid down for grass, this precaution is not necessary, because tillage weeds will not flourish so as to do much damage in grass lands. Or if low ground hay has been used by itself in feeding the young part of the stock, as it often is, the dung that is made of that, should be laid on the driest parts of the farm; for should the seeds sprout and come up, they will not be likely to prosper, as the soil does not suit their nature, being mostly aquatics. Marle, mud, ashes, lime, soot, sea-weeds, &c. having no seeds, will not propagate weeds, unless by vivifying latent seeds in the soil.

Another thing which is indispensably necessary to prevent the abounding of weeds, is to suffer no weeds, either in gardens or in tillage lands, to ripen their seeds in autumn, and scatter them out upon the ground.

Before the seeds of the weeds are ripened, the prudent husbandman, if he has neglected his duty thus far, will go over his grounds and destroy all the weeds that appear. If there should happen to be considerable quantities of them, they should be piled in heaps, in the borders of the fields, and a little earth thrown on them; in which situation they will ferment and putrify, and become good heaps of manure the succeeding year.

The objection to the labor of doing this, is answered by the consideration, that it will save them more labor in future, in subduing the weeds, after the ground is filled with them, besides procuring them the advantage of having much better crops.

Another preventative of the increase of weeds, is burning the stubble as it stands after reaping. On land that is designed to be sowed the next year, this is good husbandry. For it

will not only destroy so many of the seeds of weeds as to prevent the ensuing crop from being weedy, as it otherwise would be, but will also destroy many insects, clean the ground, and render it more fit for the operations of tillage; besides the soil will be fertilized by the ashes of the stubble.

But to prevent the increase of weeds, as well as for other good purposes, it is not best that two broad cast sowed crops, when it can be otherwise ordered, should succeed each other. When a hoed crop is well tilled every other year, the weeds are not wont to increase in such a degree as to be very troublesome.

Another precaution, and which has not been sufficiently attended to, is to avoid sowing the seeds of weeds with grain and other crops.

Notwithstanding all the precautions that may be used, however, some weed seed may be wafted by the winds from other fields, and will be found in the farmer's enclosures; he should, therefore, practice the most effectual methods of subduing them.

One way to effect this is by summer fallowing, alternately ploughing and harrowing the ground in dry weather, as often as the weeds appear in plenty on the surface. By this operation a large quantity of weeds is destroyed and converted into manure, and the seeds of another crop so exposed that they will spring up, and at the next stirring of the soil be destroyed. If these operations are continued until no more weeds arise, it may be concluded the ground is in good order for a crop, and thereby too, made more fertile.

But the modern improvement of land, by substituting the system of a rotation of crops, for the summer fallow, seems to be well calculated to prevent the prevalence of weeds, as well as to preserve and increase the productive powers of the soil.*

* See essay on rotation of crops as a substitute for summer fallow.

In that system of agricultural operations, the hoed crops, as corn, potatoes, &c. or peas sowed thick, so as to form a close cover to the surface, will keep the weeds under, so as to prevent their going to seed; until the seed of a winter or spring crop of grain follows, and the tillage land laid down to grass with clean grass seed. A strong sward will then be formed, thro' which the tender kinds of annual weeds will not penetrate, of which sort those generally are that are found in land that is tilled. It is said that even the quitch grass, one of the most noxious of all weeds, is by this means either destroyed or rendered harmless; for if it even flourishes in grass ground it makes good hay.

The limits of these short essays will not admit of a description of the particular weeds that infest our lands.

The weed called the Canada thistle, which is perhaps most prevalent in the northern parts of New-England and New-York, flourishes in close and stiff soils; but does not prevail often in those which are dry and gravelly, or sandy. In lands which have been closely pastured for a number of successive years, it will nearly disappear; and in mowing grounds its growth will be constantly retarded, where the grasses grow luxuriantly.

Pasturing, cultivating tall grasses, and keeping the lands highly manured, will be found among the most effectual methods of getting rid of this thistle, except perhaps, the culture of hoed crops. If they are not otherwise destroyed, they should be cut up in autumn, about the beginning of September, and burnt before they have scattered their seed.

It is said by Mr. Deane, that "common thistles, cut an inch above the ground, will not be so difficult to subdue, as those cut at the same time with the hoe, and below the surface. In the former case the remaining stub of the thistle gets filled with water, which rots and destroys the plant. This mode of cutting may operate with similar efficacy on the Canada thistle.

But it signifies little for one farmer to destroy the thistles in his ground so long as they are suffered to flourish in contiguous fields ; because the seeds are wafted in the air from field to field, to a considerable distance. For this reason it is, that in France, a man may sue his neighbor for neglecting to thistle his ground in the proper season ; or may employ people to do it at his expence.

The great importance of keeping tillage lands clear of weeds, was probably one great reason which led to the introduction of the drill husbandry among the European farmers ; as by leaving the grain very thin between the drill rows of culmiferous crops, as wheat, rye, barley, &c. a passage between the drill beds is thereby provided, by which more convenient access is had to the grain for the purposes of clearing the weeds from them.

The weeding of culmiferous crops, when sown in the broad cast way, is much practiced in Europe, and great additions are believed to be thereby gained to the crop.

ECONOMY OF SAVING STRAW.

Notwithstanding the English farmers have hitherto so much exceeded the American, in the business of saving and preparing compost manure, the following remarks from the *Agricultural Encyclopædia* may convince us of the great value of that part of husbandry, in the estimation of the agriculturalists in England, and that the inattention to that business, was, even there, chargeable as a great defect in their rural economy.

“As straw is the basis of manure, it might be expected that every good husbandman would bestow the most sedulous attention upon the shearing or cutting his crop, so that the greatest possible quantity of the raw material may be procured. Very different, however, is the conduct of farmers in general; as over one half of Britain, it may be safely estimated, that at least one fourth of the straw is left in the field, where its strength is wasted and dissipated by the rains and storms that commonly prevail at the conclusion of Autumn.

While it is recommended, that the crop should be cut low, in order that materials for making manure may be increased, that accuracy is not contended for that cannot be repaid by the benefit to be derived from the extra care that might be bestowed in cutting it with view to that object. By running the sickle upon the ground, drawing a level stroke, and gathering no more into the hand than can be fairly cut, all the advantages of low shearing are obtained at a very trifling increase of expence. By a steady perseverance in this practice, from one to two tons of manure per acre, may be annually gained more than is procured in the common mode of cutting the straw, especially where the crops are good. This annual increase must operate powerfully upon the improvement of the country.

The benefit to be derived from saving straw as food for cattle of every description, presents to the farmer a sufficient inducement to save all he can by any prudent measures, even if after being thus appropriated it was of no farther use, as a manure. It has been found from repeated experiments, that neat cattle, horses, or sheep can be kept as well on wheat or rye straw with a very little oil meal, or that of almost any kind of grain as upon good hay, the value of which has generally been considered much less, than the quantity of hay usually thought necessary; and after it has been used as food for cattle, it is prepared in the best manner possible for a rich and efficacious manure.

It is believed that the straw which is left to waste in the field after harvest, by evaporation, and also that which is spoiled for cattle's food, from the careless manner in which it is given to them, if it were saved and converted into manure after having first been made conducive to their support, it would be an improvement in our system of domestic economy, which would increase the agricultural resources of our own country."

It should be considered, that straw, as a constituent of compost manure, merits a different consideration from any other, except that of Indian corn stalks, in as much as the farmer from necessity must provide large quantities of this article as an appendage to his bread stuff. It is therefore, obviously a dictate of wisdom to turn it to the best account in his agricultural operations. After taking from it the seed, whatever substance he can give to his live stock from it, before it is appropriated as a manure, is an object which claims from the farmer the most sedulous attention. The remarks relating to straw, in the essay on manures, relate to the mode of applying it for that object in its crude state; but in no way can it be rendered so valuable a manure, as that of first feeding it to cattle. The dry fibrious substances in straw, exceed those in good hay, in proportion to the respective nutritive aliment

they contain. For that reason, probably, cattle prefer the former, when both are offered them. But this furnishes no conclusive evidence against the value of straw, any more than the preference which most men might have to the most delicious and expensive food, above that of the simple potato, when both were offered on equal terms, would furnish against the value of that root. It is not perhaps, well ascertained, that well saved straw, free from rust or any other disease, does not contain as much nutritive aliment as good hay, in proportion to the fibrous substances with which they are respectively coated.

While cattle are kept on straw, they should have no hay given them, and it should be placed in racks or mangers, to prevent their trampling it under their feet; and with a little oil meal, or that of any other kind of grain, or succulent food, as potatoes, turnips, or carrots, they may be kept well, where the whole expence of their keeping, taking into consideration the value of seed taken from your straw, would not exceed that of hay. It may answer a better purpose when fed to sheep, to have it cut, and after being wet, and mixed with a little of some kind of meal, such as the farmer may have at hand.

In a report of the Berkshire agricultural society, mention is made of a straw cutter, with which it is stated, that two men, the one to feed and the other to turn, will cut at the rate of sixty bushels of chopped straw in an hour.

But it is well attested by experiment, that either neat cattle or horses will eat straw without cutting; when fed with that or any other kind of grain alternately, in moderate quantities, having no hay; and may be kept in good plight on such food, requiring at the same time but little water.

GYPSUM, OR PLASTER OF PARIS.

It will be seen from various experiments, relative to the application of plaster as a manure, that very different views have been had respecting the best mode of rendering it most efficacious. Sir Humphrey Davy observes, that the reason why gypsum is not generally efficacious, is probably because that most cultivated soils contain it in sufficient quantities for the use of the grasses. That in the common course of cultivation gypsum is furnished in the manure; for it is contained in stable dung, and in the dung of cattle fed on grass; and it is not taken up in corn crops, or crops of peas and beans, and in very small quantities in turnip crops; but when lands are exclusively devoted to pasturage or hay, it will be continually consumed. He further observes, that Lord Dundas informed him, that having tried gypsum without any benefit, on two of his estates in Yorkshire, he was induced to have the soil examined for gypsum, and this substance, was found in both the soils.*

Col. Taylor, in answer to some questions by Mr. Jeffreys, respecting the nature and effects of gypsum, observes, that he sows from three pecks to one bushel of plaster upon an acre; that it succeeded upon all soils to which he had applied it; those requiring to be drained excepted. Sown on clover in the spring, it benefits it considerably; that used in any other mode, he ploughed it in. But I have, says he, even discontinued the first practice, from observing that when plaster is sown and ploughed in with wheat in the fall, a top dressing to the subsequent clover is of little or no use; and from thinking that the effect of the plaster sooner ceases, as a top dressing, than when ploughed in. That the best ways of using it are in the spring, upon the long manure of the preceding winter, to be ploughed in with it upon well covered fields, to be sown immediately before they are fallowed. In rolling it very wet, with

*See Elements of Agricultural Chemistry, p. 224, 225. Phil.ed.

seed corn, bushel to bushel, and in mixing it with seed wheat so moist as to let the wheat divide in sowing, in such a quantity as that the land shall receive not less than three pecks to the acre. The latter is chiefly for the sake of the succeeding clover. The wheat is benefited in a very small degree, but it prevents embezzlement of the seed. He thinks it a valuable ally of, but by no means a substitute for, manure. That there should be intervals of two, three, or four years between applying it to the same land. That its effect is graduated by the quantity of vegetable matter upon which it is sown. That upon close grazed land it does little good at first; and repeated, would become pernicious; and that it must be united with long manure of the winter, or the ungrazed vegetable cover produced in the summer. That all crops are ultimately improved by its improving the soil, even when its effects are not immediately visible, but he does not recommend it as a top dressing, except for clover. M. Canolle, a French writer, observes, that plaster, acting, or operating chiefly on the absorbant system of plants, its effects are not like those of manures buried in the soil, which act principally on the roots. The latter, according to their particular nature, divide, soften, enrich, warm, or stiffen the soils with which they are mixed. The quantity of plaster, spread upon the land, is so trifling, that it can have little effect on the soil. I speak, says he, from experience. Plaster buried in the earth where sain foin has been sown, has produced no visible alteration; whilst the same quantity of plaster spread over the same surface of sain foin, has produced the most beautiful vegetation. From this experience, so uniform in the application of plaster, I am led to believe, that one must consult as well the nature of the soil, as the kinds of plants to which we apply plaster. Thus whatever may be the soil on which clover, lucerne, and sain foin naturally flourish vigorously, or with that vigor which encourages us to apply manure, there is no risque in trying plaster.

In an essay on manures, which took the premium in Albany, in 1819, some remarks were made on the proper manner of

applying gypsum as a manure for a crop of winter grain, in which, it is observed, that this manure, when applied to such crops when sown, or in the spring following, has scarcely any preceptible effect in increasing their growth. In order, therefore, to render the manure profitable, in applications of this kind, the ground must be enriched with gypsum, previous to its being broken up, preparatory for what we call a summer fallowing for the crops in question. If, for instance, a field is intended to be broken up, say by the middle of June, for the purpose of being sown with winter grain in the fall, this manure is to be strewn over the sward early in the spring, or perhaps in the fall preceding; at all events, a sufficient length of time previous, for the manure to exhibit its effect on the land. This is to be known by a growth of white clover starting up, and the sward exhibiting a fine green appearance; and as soon as this change is effected in the appearance of the sward, it may be turned over for a crop of winter grain.

I have been more particular on the subject of gypsum, because it is become a very important item in the expence of agricultural operations, which is often lost to the farmer for want of complete knowledge of its proper use and application, and also for the purpose of convincing the farmer of the necessity of attending to the information derived from the experiments of others, as well as from philosophical investigations. It is not impossible that its inefficiency, often attributed to a defect in gypsum, may be owing to the peculiar state of the soil to which it is applied, or to the mode of its application. Many of the most prevalent opinions respecting its efficient agency, as a manure, have proved fallacious, both by experiment and chemical facts.

REMARKS ON THE EFFECTS OF DIFFERENT SHADES ON VEGETATION.

As trees are placed either naturally or artificially around the borders of fields appropriated to tillage, it is important that the farmer should be apprised of the different effects which the shades of different trees may have on certain plants. The information on this subject is derived from the certificate of Mr. Livingston, of New-York.

I planted maize, says he, on the west side of a young wood, consisting of oaks, poplars, a few chesnuts, and a large mulberry somewhat advanced into the field. The shade made by the rising sun extended nearly across the field, and was not entirely off until about ten o'clock. I remarked, that as far as the shade of the chesnut reached, the corn was extremely injured; it was yellow and small. The conical shape of the morning shade, from particular trees, might be traced a considerable extent, in the sickly appearance of the plants. The black oaks were likewise injurious, but less so than the chesnuts: the poplars, very little so. Near the mulberry tree the corn was covered by its shade for a very long time every morning, and though not so large as that which had more sun, maintained a healthy appearance.

He further remarks, that the shade of the black oak is particularly hurtful to the growth of wheat: that of the locust is, on the contrary, beneficial to grass grounds: and that of the sugar maple does but very little injury to the growth of grain, and none to grass.

From the observations respecting the effects of the shades of the sugar maple, the mulberry, and the locust, it might be expedient to plant those trees around some fields, designed for pasture, grain, or meadow; especially the locust, which, in the essay on the management of wood land, is described to be ve-

ry valuable for many mechanical purposes, which require solidity and durability. It will propagate itself, too, in the most barren places, where the soil is even so light as to be blown away by the winds. By sheltering such places, and dropping its leaves on them, it causes a sward to grow over them, and grass to grow upon them. It is, however, objected by some, that it is not advisable to plant the locust on the borders of fields, on account of their spreading too much, by scattering their leaves, unless on those which are most barren. This objection, however, it would seem, might be obviated, when the field to be enclosed by the locust was often to be appropriated to the purposes of tillage, especially to the culture of the hoe, by which every superfluous plant may be suppressed.

It is of importance to the farmer, when making a new settlement, to ascertain, by observation, the effects of the various forest trees, on vegetation, that he may be able to decide correctly respecting what ones are most proper to be left standing on the borders of his fields.

In some of the best cultivated parts of Europe, as well as America, the border of the field adjoining the highway, is often found ornamented with either a natural or artificial row of trees, such as are found least injurious to vegetation; and which are often, too, appropriated as important constituents of the fence.

It is believed that the shades of many other trees, that have not been mentioned in this essay, will be found to be but little injurious to many of our valuable plants.

So far as this inconvenience can be avoided, it is hoped the disposition for the destruction of our trees generally, will be less prevalent. Monsieur Mihaux, in his work on the forest trees of North America, in stating the causes which induced so general a destruction of them in this country, observes: "The cost and expense of clearing our lands, compared with their value after they were cleared, and the difficulty of eradicating completely the after growth, were so great, and the forests

themselves appeared so vast in proportion to the probable demand for fuel, and wood for building, and other purposes, that no man dreamt that the day would arrive when their descendants might regret the improvidence of their ancestors. Hence there seems to have been a sort of hatred, an indescribable prejudice against trees, especially around their dwellings."

The above causes, perhaps, can alone account for the fact, that in our climate, where the summer months are so hot, compared with the climate of Europe, and where the clearness of the sky seems to render shade so much more important, we find such a general warfare waged upon trees, in the vicinity of dwelling houses, and about fields, where they might have remained without any detriment to plants,

ADVANTAGES OF EXPERIMENTS.

It would greatly advance the farming interest, if more experiments were made in our country, where the science of agriculture is yet in its infancy. We ought not to rely too much upon the experiments made in other countries, as proofs of the utility of one mode of culture in preference to another, in this country. Therefore, we should not trust to the experiments of Europeans, but make experiments for ourselves. Till this is done we are not to expect improvements in husbandry will rapidly progress. It is true, there is some hazard attending new experiments. Therefore farmers in indigent circumstances, should venture with caution on experiments, except on a small scale; as the failure of a year's crop might greatly embarrass them. They might, however, compare one crop with another, estimating the cost expended in the culture of each, and of one course of crops with another, as also the different effect of manures on the same, or different soils; and by this means they may find which methods are preferable, by a little attention, without any risque. It is necessary to learn what practices should be continued, as well as what to adopt, or bring into use. Gentlemen who possess large estates may sustain considerable losses without suffering material inconvenience from it, should they fail of success. They should, therefore, from principles of patriotism, hazard experiments, for there can be no reason to doubt but that our husbandry may admit of many very important improvements.

The making of experiments, would not only tend to the improvement of our agricultural science, but would prove a source of interesting and laudable amusement to persons who have leisure, and are in a condition to make them.

Trench ploughing, which has not been much practiced in this country, should be tried by those who have deep soils, clear of

rocks and other obstacles. Trials should be made of the advantages which might result from ploughing flat land into ridges ; and whether ridge ploughing will not have a tendency to secure grain from destruction by winter frosts. Attempts should also be more extensively made, to raise winter wheat, which is the most valuable of all grain ; also to obviate by culture, if possible, the causes of the failure of wheat crops on our flat, deep, rich soils, on which it is well known, attempts to raise wheat, successfully, have hitherto proved abortive, and generally been abandoned. To discover also the best steeps for grain and other seeds, to quicken vegetation and secure them against smut and insects. What also may be the best quantities of seed for sowing in different soils ; and the peculiar advantages which might result from sowing different seeds with a drill. Also whether drained swamps are not the most profitable lands, or what crops can be best raised upon them : how lime as a manure will answer in our hot summers, and on what kind of soil it is most profitable.

In making experiments, care should be taken that we do not draw conclusions too hastily. We ought seldom to do it from a single trial. For a certain practice may answer well at one time, owing to the peculiarity of the season, or some unknown cause, which would not have the same operation at another time. Too much confidence in single experiments, might embarrass or mislead, rather than increase useful agricultural science.

If experiments are intended to make improvements, they should be carefully recorded. For want of such records, much useful knowledge is continually lost. Though many individuals have derived advantages to themselves from experiments, but few have recorded them. Even those who make experiments are liable to forget them, so as to give incorrect representations of them when they attempt to relate them.

Many useful discoveries therefore often die with those who make them. To prevent these evils, either voluntary opera-

tions of individuals, or a board of agriculture should be formed in every well regulated community, to collect and record for the benefit of the present generation, and for posterity, useful and important agricultural information.

ACCOUNT OF A COTTAGER'S CULTIVATION.

SHOWING HOW GREAT PROFITS MAY BE OBTAINED FROM
A SMALL PIECE OF LAND.

There is in the United States, and indeed in every civilized country of which we have any knowledge, a large class of citizens who are greatly dependant for their support on the produce of small parcels of land, perhaps one or two acres.

It has been said that an ancient Roman understood so well the art of cultivating the soil, that he could support his family upon the produce of one acre of ground. It may be expected that in the United States, that class of citizens whose condition will render them dependant on the produce of a very small piece of land for their subsistence, will hereafter be very numerous. It may therefore be truly said, that the science which enables us to acquire the greatest quantity of useful vegetables from a small piece of ground, is of most importance to that class of our citizens to whom we shall be greatly indebted for our physical strength. Those of that description, who would better their condition, and increase their comforts, may derive essential benefits from the following account of a cottager's cultivation, in Shropshire, England; published by Sir William Pultney, Bart. May, 1805.

Within two and a half miles of Shrewsbury, a cottager, whose name is Richard Millward, has a house, and adjoining to

it, a garden and land; making about one acre and one sixteenth of an acre, including the garden. He is a collier: and the management of the ground is in a great measure left to his wife. The soil was a thin covering of about three or four inches of strong loam, over a clay impregnated with iron, and considered as the worst soil. They pay three shillings sterling of yearly rent for the house and land. It was leased to them thirty-eight years ago, for three lives, one of which is dead.

The wife has managed the ground in a particular manner, for thirteen years, with potatoes and wheat, chiefly by her own labor; and in a way which has yielded good crops, fully equal or rather superior to the produce of the neighboring farms, and with little or no expense.

The potato and the wheat land (exclusive of the garden) contains sixty-four digging poles of land, (eighty yards square to the pole, and seventy-five of which make an acre,) and is divided into two parts. One of the divisions she plants alternately with potatoes, and the other is sown with wheat. On the wheat stubble she plants potatoes in rows; and sows wheat on the potato ground. She puts dung in the bottom of the rows where she plants potatoes; but uses no dung for the wheat. And she has repeated this succession for nearly thirteen years; but with better success and more economy, during the last six or seven years.

She provides manure, by keeping a pig, and by collecting all the manure she can from her house, and by mixing it with the scrapings of the roads, &c. She forms it into a heap, and turns it, before she puts it on her ground for potatoes.

The ground is dug for potatoes, in the months of March and April, to the depth of about nine inches. (This digging would cost sixpence per pole, if hired.) After putting in the dung, the potatoes are planted in rows, about twelve or fourteen inches distant. The sets are placed about four or five inches apart in the rows.

When the potatoes come above the ground, the weeds are destroyed by the hoe; and then laid up on both sides to the shoots. And this is repeated from time to time, as the seasons require. Hand weeding is also used, when necessary.

In the month of October, when the potatoes are ripe, she takes off all the stalks, (or haulm) of the potato, which she secures, to produce manure, by means of their pig. She now goes over the whole with a rake, and takes off all the weeds; and before taking up the potatoes, she sows her wheat on as much ground as she can clear of potatoes that day. They are taken up with a three-pronged fork; in which her husband assists: and by the same operation, the wheat is covered deep. She leaves it quite rough; and the frost mellows the earth, and by the earth falling down, it adds much strength and vigor to the wheat plants in spring. Her crops of wheat have been of late always good; and even this year, (which in this country has not been favorable for the wheat crop,) she has threshed fifteen Winchester bushels from thirty-four poles; though part of her wheat had suffered much by the mildew. The straw of her wheat she carefully preserves for litter to her pig, and to increase her manure. When her potatoes are gathered, she separates the best for use, then a proper quantity for seed, and the small potatoes are given to her pig.

She has sixteen poles for her garden ; upon which she plants peas, beans, and a part with cabbages ; but has early potatoes, and peas and cabbages, and boils the turnips for her pig.

The only other expence of feeding her pig, is two or three bushels of peas ; and when fit to kill, it weighs about three hundred pounds. She buys it at the age of four or five months, about the month of February ; and it is killed about the month of January in the following year.

When she first began this method of alternate crops, and for several years after, she depended on the neighbouring farmers for ploughing her land and harrowing, both for the potatoes and wheat : but as the farmers naturally delayed working for her, till their own work was chiefly over, her land was not ploughed in proper season. She has been for the last six years independent of the farmer.

She is careful to sow no more land at a time, than she can clear of potatoes that day.

Observations by the same writer.

This mode of culture proves, that potatoes and wheat can be produced alternately upon the same land, for a long course of years, provided that a small quantity of manure be every year used for the potatoes; and it shews that a cottager may procure food from a small portion of land, by his own labor, without any expence.

Both wheat and potatoes have been reckoned exhausting crops ; but this mode of culture shows that great crops of both may be long alternately produced ; which may probably be imputed to the culture by the spade and hoe, to the manuring every second year for potatoes, to the careful destroying of weeds, to the planting and sowing in proper season, and to the preventing the earth from being too loose, (by the mode of sowing the wheat before the potatoes are taken up.)

An experienced farmer is of opinion that the same culture and succession of crops, will answer in almost any land, if properly drained and skilfully managed ; for that although strong land does not answer well for potatoes, nor very light land for wheat, yet that cultivation and manure, (and particularly the manure of lime) will soon render strong land, when drained, more loose ; and will make light land more firm, especially if cultivated with the spade and hoe.

ON THE CULTURE OF GARDENS,

AND ITS ADVANTAGES TO EVERY CLASS OF CITIZENS.

THE profits which may be derived from the culture of a garden, are much more than those are aware of who have not made it an object of attention. It will be found of great importance, even to the farmer. For it is believed that the use of the various vegetables, which may be therein produced, might supercede the necessity of consuming such large quantities of meat as is too often practiced, not only by our farmers, but by every class.

There is in the United States, as in every civilized country, very many who are greatly dependent for their support, on the produce of a small parcel of land, a garden only, or perhaps one or two acres in addition; and it may be expected, that in the progress of our history, that class of citizens will continually increase, and become very numerous. To that class, therefore, on whom we may expect to be greatly dependent for our physical strength, the science of gardening is particularly important; as it will enable them to acquire the greatest quantity of useful vegetables from a small piece of ground.

Gardens consist of three divisions, the kitchen, the fruit and the flower garden. The latter is of little utility, except for ornament. The art of planting may, however, be so understood and practiced, as to render useful vegetables when growing, highly ornamental. Every plant, or fruit tree, which pertains to a garden, had better be included in the same inclosure; though it is not best to have fruit trees and plants blended together, as is often done; the shade of fruit trees being injurious to the growth of most kinds of vegetables, should be placed by themselves.

The quince, the currant, and some other shrubbery, may be intermixed with other plants without much injury, as they make but little shade. The garden vegetables, which have been found of most general utility, are, beets, carrots, parsnips, peas.

beans, sallads of different kinds, cabbages, squashes, mellons, onions, and corn and potatoes of an early growth, for culinary purposes.

Of the different kinds of beets, the red winter beet is believed to be the best. The early beet of a white or pale red color, comes to maturity much sooner, and is very productive, but is of a more insipid flavor, and less nutritive than the red. This root boiled, is a very nutritious vegetable to use with every kind of meat, and also makes an excellent pickle when preserved like the cucumber, in vinegar. It is also raised in some parts of Europe for the purpose of making sugar, and ardent spirits, which gives it an additional value. The beet and carrot may be sown from the tenth to the twentieth of May, varying according to the difference of climate and season, in the New-England States. The parsnip may be sown much earlier, as the seed does not germinate so soon, and it is not affected by the frost.

To prepare the ground properly, for the reception of the seed of either of these roots, the soil should be made very rich, and mellowed to the depth of ten inches, and perfectly pulverized, so that no hard substance or clump of earth may come in contact with it. To effect this, it is always best to plow the ground first, when fruit trees or shrubbery are not in the way, as by that means the soil is more easily and effectually mellowed with the spade. The seed of beets, carrots, and parsnips should be barely covered with light earth, in rows across the bed, and at the last weeding, should be thinned so as to stand about four inches apart, the same distance to be observed between the rows, though carrots will often grow to a good size if left standing much thicker. In the management of the parsnip, we may see the tyranny of custom, and one of the evils of ignorance. The farmers and other citizens generally, through the country, are governed by a tradition that the parsnip is only a rarity, to be used a few days in the spring; and that it should be kept in the ground through the winter, when by digging it in the fall they may provide their table with a very pleasant,

and useful vegetable, and thereby not only gain the longer use of the plant, but have it in much greater perfection, as it often cannot be taken up in the spring until it has sprouted, and the inside of it become ligneous. It is better to pack them in a box and cover them with sand, or some of the earth from which they are taken; but they may be kept well as beets or other roots, and not liable to injury from frost; besides it takes from them that rankness of flavor offensive to some tastes. The beet root, when in the early stage of its growth, boiled with its top, is an excellent sauce for any kind of meat.

Among the great variety of peas cultivated in the garden, are the small early pea, the marrow fat, and the sugar pea. The first, which is often called the June pea, grow about three feet high, ripen very early, but are not very productive. The marrow fats and sugar pea grow five or six feet high, in a rich soil, and are much more productive. They should be sown in two rows, about five inches apart, and it is best to set two rows of bushes on each side of the rows, which will secure the vines more effectually from falling down. The bushes of the latter kind should be six feet high, but the early June pea require a bush of only three feet in height. These kinds of peas may also be sown in the broad cast way, and for those who have land enough, it is the cheapest way of raising them, as it requires considerable time to procure and set the bushes; though it is believed, the size and flavor of the pea is improved by garden culture; and as the bush furnishes the vine with more atmospheric space, in which it may extend itself, a much greater quantity may, in this mode of culture, be produced.

After the peas have had their growth, and the vines are on the decay, they may be removed, and the soil mellowed and cleared of weeds with the hoe and rake, and the seed of turnips sown across the bed made for the purpose, from four to five inches apart; and sown so that they be wed with the narrow garden hoe, and thinned so that the plants should be left standing two or three inches apart; if fowls are kept from running over them and eating the leaves, and insects are kept

from devouring them, by some of the means described in the essay on insects, a valuable crop of turnips may be raised, which will compensate for the extraordinary expence of cultivating the pea, which also furnishes one of the most nutritive and delicious vegetables for the table.

Among the various modes of planting the garden bean, it is believed the greatest quantity may be raised on a given spot of ground, by planting them in rows, about eight or ten inches from each other, and the seed in the rows about one inch apart ; perhaps too, the same quantity of soil may produce rather more, by planting those which are called the poll bean, in hills about eighteen inches apart, and erecting a poll near the hill, from five to seven feet high. As there are a great variety of beans, distinguished by their color and qualities, the choice of them will be directed by the discretion and tastes of those who cultivate them. When boiled, and mixed with boiled green corn, they make a very delicious sauce.

MELONS. Of this fruit there are but two species. The mellon with a rough coat, and that with a smooth skin. The first is called the musk, from its peculiar flavor, and the other from its thin and abundant juices. Of these there are many varieties. The most approved of the musk mellon species, are said to be the cantelope, the citron, the nutmeg, and the Persian ; and of the water melon, the Carolina, the Maltise, the Candia, and the Chate, or Egyptian. As both of these species, and all their varieties, succeed best in a hot climate and sandy soil, it is obvious that in the colder climate of our country, to succeed best in their cultivation, a spot should be selected well defended against the north wind, and open to the sun throughout the day. In the most northerly part of our country, the only difficulty in the culture of the melon arises from the shortness of the warm season, it being but barely sufficient to bring them to maturity ; they cannot therefore be expected early in the season without the use of artificial heat, by means of hot beds. But as the best substitute for such means, and to insure

a crop, a hole may be dug about twelve inches, and filled with strong barn manure to the depth of about five or six inches, and covered with common sand, on which six or eight seeds may be planted, and thinly covered with a rich earth. The hills should be about five feet apart, and three or four plants left standing in a hill. If more than this escape the ravages of the insect, they should be pulled out. But it is thought this mode of culture is not necessary when the soil is presented to a southern exposure, and is very fertile; though it is believed the former may better secure them against the attacks of the insect. The seeds of the last year only should be sown, because they vegetate quicker than old ones, and accordingly best promote the object of the hot bed, which is to give early fruit.

Another provision for the want of early and continued heat, gardeners would make choice of those varieties which have the thinnest skins, and least bulk, as such require the least heat, other things being equal. If the branches are long and vigorous, it has been practiced by some, to stretch them carefully over a level surface, and bury every fourth or fifth joint, that wherever the plant is buried new roots may be formed, for the better nutrition of the stem and the fruit.

The ripeness of the musk melon is known by its color and its odor, and by the drying of the stem where it attaches itself to the fruit.

The water melon furnishes neither of these signs, but affords another peculiar to itself, a hollow sound on being struck on the rind, the result of an actual hollowness beginning and increasing with its maturity.

ONION. This is called by botanists the *Allium Cepa*, and has many varieties distinguished by color, size and taste, and one of them, the canadense, by organization, its fruit growing on its head, and in the place of flowers. Of these varieties, the red is the largest, but most acrid; the pale red and the yellow,

are less in size than the red, and somewhat milder, but the white, (of Spain and of Florence,) though the smallest, are the mildest, the soonest fit for use, and the best for keeping. They are eaten by some like apples. On analysis, they are found to possess less of those elements (oil and sulphur) which give the common onion its peculiar taste and smell. A rich sandy soil is the most favorable to the onion. They have been known to grow to the size of a foot or more in diameter. In clay or stony soil, or pure sand, the onion does not prosper. It is propagated by the seeds or the bulbs. It is said the Tartars propagate them by cutting; they slit the bulb downwards, and leave to each cutting a portion of the fibrous roots.

When sown, it should be in drills, twelve or fourteen inches apart, cover with mould, and when the plants come up, they should be thinned, so as to stand three or four inches apart. The ground should be mellowed at the depth of three or four inches only. After the earth has acquired a temperature favorable to vegetation in the spring, the sooner they are sown the better. In hoeing them, they should only be kept clear of weeds, and the dirt loosened about them, but no earth drawn upon the root to hill them. The tops should be broken down after they have grown to the length of eight or ten inches, that the juices may determine to the bulbs. The small half grown onion may be instituted for the seed. The canadense variety should always be managed in this way: They may be preserved through the winter in a dry and moderately warm cellar. Frost does not injure them as it does many other roots. The largest are set out in the spring for seed, and when perfectly ripe, the stems are cut, and the seed left in the capsules for use. If preserved in this way, it is said the seed retains its germinating power much longer than if thrashed immediately after ripening.

SALLADS. Of these, lettuce is [the plant in most general use, the principal varieties of which are, the head lettuce, the curled lettuce, and the lettuce with open, straight, and erect leaves; although botanists, it is said, have multiplied the varieties of

this plant to the number of one hundred or more. The head and curled lettuce should be sown early in the spring, in beds, in rows across the bed six inches apart. When the plant is up, and the leaf grows to the size of half a cent, they should be thinned so as to stand three or four inches from each other, or they may be sown in a bed, and the plants transplanted like cabbages. The seed may also be sown in the fall, and as the frost approaches, covered with a light layer of stable litter; which in that case should be removed in the spring, and the surface of the bed loosened with an iron toothed rake; it is said the first vegetation that shews itself will be that of lettuce, and it may be thinned and cultivated where it stands, or transplanted into beds, as that which is sown in the spring.

CALE is a species of the cabbage, and like that plant, boiled for use. It is distinguished for its upright, long, broad, and open leaves. It has the power of resisting frost beyond that of any other variety of the family. Frost that would be destructive of head cabbage, will make Cale better. This fact gives it a preference for garden culture, which is always for spring greens. There are a great variety of other rare sallads, a discription of which is not compatible with the limits of this little volume.

CABBAGE. This plant requires a rich, strong soil; and will, it is believed, grow yearly on the same ground without much exhausting the soil. When an early crop for the table is intended, the seeds should be sown very early, as soon as the soil presents signs of spontaneous vegetation. The seeds may be sown in the beds where they are designed to be cultivated, though transplanting is the best method. The plant should be set up to the leaves, at least two feet apart. But to insure a good crop, the ground must be well worked, and abundantly manured with well rotted dung. When the crop is intended for fall or winter use, the seeds had better be sown some later. The Romans, who were said to be very successful in the cultivation of the cabbage, aimed particularly at giving to the plant great size. And it is believed its tender and delicious

qualities are in some measure proportioned to its magnitude. Frequent hoeing or stirring the ground about the plant, especially in the morning while the dew is on, will greatly accelerate the growth, and increase the size of the head.

When they are kept in the cellar for winter use, it is the practice of some to hang them up with the heads downward; they may be kept also through the winter by cutting off the heads, and laying them away in a cask filled with snow, and keeping them in a cold place. For a spring supply, the following mode is recommended: to make a trench in a dry soil, and line it with straw: set the heads in closely together, with the roots upwards; cover them with straw, and then with earth, piled up as steep as possible. In this manner it is said they will keep till May, and occasionally dug out as they are wanted.

The common white and red cabbage, the winter-green globe, and the Dutch, Scotch, and Savoy, are mostly in use. The white and winter green globe are best for winter use; the red for sallad, and the others are early, and have smaller heads.

ASPARAGUS is one of the first green vegetables which the opening spring presents, and for which no substitute equally productive can be had till the season for green peas and beans, which are not usually to be had until some time in the summer. It is an excellent green vegetable, with any kind of meat either roasted or boiled. It is usually prepared for the table by tying it together in bunches three or four inches in diameter, and boiled; its nutriment and flavor very much resembles that of the pea.

There are various modes of cultivating it. The following is the most usual and simple. Open a trench four or five feet wide and one foot deep, in the warmest part of your garden, the warmer the better. Fill the trench half full of good barn dung; level it, and scatter some good earth over it; then lay on your roots eight or nine inches apart, in their natural position: or if seeds be used about half the distance apart; then

to complete the bed, fill up the trench with good soil. If roots are planted, they may be cut the second year; but if seeds, not till the third. After the bud is fit for use, all the shoots which come up before the middle of June, may be cut off, but all after that should run to seed to strengthen the plants. In the fall they should have a layer of rotten dung spread over them an inch in depth, which may in part be taken off the next spring; and when the bed becomes too high by the constant addition of dung, part of the earth may be pared off in the spring, before the plants shoot, and the bed covered again with a thin compost of rotten dung.

CUCUMBERS. This plant is cultivated by planting it in hills about six feet apart, other wise the vines will cover the ground so thickly that it will be difficult to go among them without injuring the vines. The greatest difficulty in raising this fruit is to keep the insects from destroying them, when the plants are young. For some, the means of effecting this, see article on insects. Those who have but a very small spot for a garden sometimes practice filling a tub or barrel half full of stones, and with as much water, over this lay some straw and fill the vessel with the richest earth, and plant on the top a plenty of seeds; spread some bushes round the tub for the vines to run on; in this way a great crop may be raised; the cask may be open at the lower end; in that case or otherwise, water must be occasionally applied to keep them sufficiently moist. It might be an improvement to this method to raise an artificial mound of earth about the circumference, and a little higher than a common barrel, and of a conical structure, the diameter of the upper surface being but one third and one half that of the base; plant on the top of it as on the cask. If the mound is composed of a considerable portion of clay, one quarter or one third, the plants would require much less water to be applied. By this method, it will be seen, that atmospheric space will furnish room for the vines, which otherwise would occupy the same extent of soil. The same economy might be practiced

in the culture of squashes, melons, &c. where the vine is sufficient to sustain the weight of the fruit without injury.

This may appear to some as the useless project of a visionary imagination. But agricultural essays should be written with a reference to the interests of distant times, and other circumstances, which in the progress of human affairs, we may expect will be inevitable.

RED PEPPER. This is said to be the annual pepper of the botanists, of which there are two species, the *grossum* and the *Irustenaus*, the latter of which is usually seen in hot houses. It requires a warm soil, and if sown early, a good deal of dung and a favorable exposition. The seeds may be placed in rows three feet apart, or in hills, at the like distance from each other. In dry weather, the plants require watering, and in all kinds of weather, weeding and hoeing. The seeds are best preserved by running a string through the pods and hanging them up in a dry garret."

There are various other plants both ornamental and useful, for garden culture, the particular description of which, can be expected from essays devoted wholly to horticultural agriculture. The author of these essays, hopes by publishing the little information herein contained, to obtain one important object he had in view, that of exciting more attention to this delightful branch of rural economy.

It has been observed that "Europeans who have travelled in the United States, have observed that the people in this country eat more meat than in any other." This is believed to be true. Besides eating meat three times a day, among the farmers, we

frequently see the table spread with nothing but meat and bread, or with only one or two of the poorest kinds of vegetables with it. It has been noticed too, that there is a very great difference in the goodness of living in families of nearly the same rank and wealth; and that good living does not depend on the expence; but on the contrary, those families who live at the greatest expence generally live the poorest. Bread and meat are by far, the two most expensive articles of food; and as most families are in the use of these articles, the difference in living in different families, depends principally on the different kinds of culinary vegetables which are prepared and presented at the table with the bread and meat. As all those kinds of vegetables are much cheaper than bread or meat, the greater the quantity of these consumed in a family, the less will be the expence of living; for it is presumed that people will consume but a given quantity of food, and that what is consumed of one kind will be spared of another. It is not enough to have but one or two kinds of vegetables on the table at once; people have not all the same taste; some will prefer one kind and some another, so that when there is a variety, every one will meet with something agreeable to his taste; and there is no loss in preparing more vegetables for the tables than can be consumed, as they afford more nutriment for domestic animals than they do in their raw state. There is no class of people in the community who have it in their power to supply themselves with such a variety of the best kinds of vegetables, at all seasons of the year, as the farmers. But this would require a garden, and some attention to it. And in this a great portion of the farmers in the northern states are generally deficient. A small piece of ground without any permanent inclosure, and planted with a few of the coarsest and most common vegetables, is all they call the garden. And even this is indifferently cultivated. One might suppose that the farmer considered the garden of little or no consequence; and the labor bestowed upon it little better than lost, while they toil excessively in the field. This is an error

which should be corrected. To remedy this defect, and render their living both pleasant and cheap, it is recommended to every farmer, who has not already done it, to select a piece of ground near his house, from half an acre to an acre, to inclose it with a permanent fence, and to break and manure it sufficiently, and plant and sow it with all the variety of culinary vegetables common to our country. Any family that will adopt this method and follow it for several years, will think it strange indeed that they had neglected this important branch of rural economy so long.

There is an advantage to be derived from gardening, which the farmer may extend to his field husbandry. It will give him an opportunity of trying various experiments upon a small scale, with respect to the different effect of the various kinds of manure, and the best manner of applying it, as also many others with respect to the culture of different plants which he would not be willing to hazard, or it might not be so convenient for him to do it in a course of field husbandry.

The husbandman is not advised to sacrifice the advantage of his farm, to the ornaments or the pleasures of a garden; his grain fields, for the culture of roses; but his attention is invited to the utility, convenience, and economy, that can be found in the cultivation of a substantial kitchen garden, from which his family may derive many innocent luxuries, which providence with a liberal hand, has spread around him.

The moral and physical effects of gardening furnish no inconsiderable motive to its occupation. It expands the mind, strengthens the body, and tends to promote habits of order, diligence, temperance, economy and observation.

MALADIES OF BEES.

A Mr. Huish, who appears to have attended much to the management of bees, acknowledges great difficulty, both in discovering the maladies of the bee, and the remedies; but adds, if you have many hives, and any one becomes sickly, remove it as soon as possible, that it may not infect the remainder. If you have but few hives, you may attempt first to investigate the disease, and next its cure. He farther states, that the dysentary is one of the most common, as well as fatal diseases of the bee. And that the mark of this disease, is the excrement voided by the bee at the entrance of the hives, in spots, like linseed, nearly black, and of an insupportable smell; and that this malady is contagious. The bees, when afflicted with this disease, destroy each other, by contaminating their wings with this excrement, and thus stop the organs of perspiration. The cause of this disease is, by some, ascribed to new honey, when eaten in winter; by some, to the deficiency of propolis, or bee bread; and by others, to the flowers of the elm, and lime, from which they extract honey. Other causes are also ascribed to this disease; in any general one, however, writers do not appear to be agreed. Mr. Huish, considers the disease incurable, although its prevention may be effected. As soon, therefore, says he, as I see any of my hives affected with it, I give them a little of the following composition, which has invariably checked the malady, when given in the early stages.

Rule.—To a quart of white wine, add a pint of honey, and two pounds of loaf sugar; put the whole into a tin sauce pan, and let it boil gently over a slow fire, skimming it at different times until it is reduced to the consistency of Syrup. It may then be bottled, and put into the cellar, and kept cool for use. Whenever it is used, it must be gently heated, until it partakes of the consistency of honey. Mr. Ronconi, an Italian author

recommends fresh urine, placed on plates near the hives, for the use of the bees. He also recommends white wine, boiled with an equal quantity of loaf sugar, with an addition of cloves and nutmegs, as doing well. Also, the bark of pomegranates, pounded and mixed with honey and sweet wine, as being conducive to the health of the bee.

Mr. Duchet recommends good old port wine, mixed with honey.

Mr. Wildman recommends fine salt as a remedy, to be placed on the bee stand, where they may eat it at pleasure.

Oat meal is also recommended in the dysentary.

All these remedies are approved of by Mr. Huish, who observes, that great care should be taken to keep the hives as clean as possible during the prevalence of the dysentary amongst your bees.

He further observes, that the antenna of the bee are sometimes diseased, and turn yellow, attended with some swelling; but considers the disease as slight. The abortive brood, although not an epedemical disorder, is still very injurious in its effects upon the bees. Two causes produce this effect: first, when the bees have given the larva improper food; second, when the worm is placed in the cell with the tail towards its mouth. In this case, the young bees, incapable of extrication, die and putrify.

The bees generally remedy the evils of this putrefaction by removing the abortive brood; but should this accident take place in winter, the infected combs may be cut out when the hives are examined in the spring. The tops of the cells, when sound, are convex and yellowish; when abortive, concave and blackish.

There are various enemies of the bee, besides the worm, or butterfly, mentioned in the essay on bees, disclosed to the author since that essay was sent to the press, among which are the mouse, of all kinds, the rat, the toad, and the ant. It is believ-

ed the attention of the keeper in fixing his apiary, may guard the bee generally against these common enemies. The king bird also, and the woodpecker, sometimes hover about the apiary to feed on the bees; they may be carefully watched and destroyed. The spider will also entrap the bee in his web, and feed on him. The spider enters the hive when the weather is cold, and the bees have lost their energies, spin their web, and thus obtain their prey. The wasp is also an enemy to the bee; he surveys the hive in summer, and whenever he finds a crevice, enters and robs the hive, and feeds on the honey. The wasps collectively, sometimes attack weak hives, the same as robbing bees, and rob the swarm.

Mr. Huish observes, that he does not know a more efficacious method of destroying wasp's nests, than sulphur. The wasp, the bumble bee, and the honey bee, all feed on the same food; for this reason, the two first should be driven as much as possible from the neighborhood of the apiary, particularly in September and October, when the herbage of the field fails, they are driven by hunger to rob the hives. Unless you watch your bees carefully at this season, they may be ruined before you are aware. The toad is also the enemy of bees, and will catch them, particularly in warm weather. He should be driven from the vicinity of the apiary. A little garlic rubbed about your hive, will guard them against the ravages of the ant.

The moth is an enemy to the bee. It is the caterpillar, which, in a certain state, gnaws our trees, books, paper, &c. Strong hives can protect themselves against the moth; but weak hives are sometimes injured and ruined. The moth, in the butterfly state, infests the hives in April and October, and by her dexterity deposits her eggs amongst the comb, and dies. From every egg a smooth caterpillar bursts forth, of a pale white, its head brown and scaly. It encloses itself in a little web of white silk, which it attaches to the combs, and in which it finds its food, by projecting its head beyond its case. When the food around it begins to fail, it prolongs its silken web; which,

though a mere thread at the beginning, becomes almost insensibly, as large as a quill. This insect, having attained its growth, submits to the metamorphosis, common to all caterpillars; it quits its residence, retires to one corner of the hive, or departs from it; spins a white covering, emerges as a butterfly, copulates, and re-enters the hive to deposit its eggs as before. This insect, next to man, is the most destructive enemy of the bee. Mr. Huish thinks a remedy against this insect is very difficult, and advises that whenever you suspect your hives are devouring by the moth, join your hive, and thus save the little which remains. If your bees become inactive, when other swarms are at work, and continue so 10 or 15 days, no time is to be lost in examining your hive, when the ravages of the moth will appear. The same author observes, save your bees if possible by removal to another hive; all their labors are lost in that hive.

Every apiarian, who expects to reap profits from his hives, must be constantly on the alert, to effect the destruction of the enemies of the bees; who always would carry on their depredations in secret.

THE ADVANTAGES WHICH ACCRUE TO THE STATE AND TO INDIVIDUALS FROM THE CULTURE OF THE BEE.

THE whole history of the proper management of the bee, would fill a considerable volume. But when the advantages to be derived from them, are duly appreciated, it cannot be believed that individuals would want inducements to pay more attention to their culture.

"It is a notorious fact, that England pays annually to the north of Germany, £40 or £50,000 sterling, for the produce of the bee, which could be saved by a small expence by her own peasantry. Even in America, we are so regardless of the profits of the bee, as to import honey in hogsheads from the island of Cuba and elsewhere. No country possesses greater advantages for the culture of the bee, and perhaps no country has so grossly neglected it."

Mr. Huish, after having gone over a complete system of the management of the bee, observes, "I consider 200 hives may be managed by one person, with some slight assistance, during the swarming season.

Some French authors eulogize the skill of M. Proerteac, who had constantly under his care, from 5 to 600 hives; this is rare, and perhaps the only one. I will state the profits of five years, upon a fair and equitable scale, making, at the same time, fair and ample allowances for the losses, which even the most skillful apiarian cannot prevent.

Suppose a person to buy a swarm in 1812, for which he pays one guinea. In the month of May or June his hive swarms, and in about ten days it swarms again; this is called a cast. His apiary now consists of three hives, from one of which, (the last,) it will be most prudent for him to take the honey, and the bees be joined to the strongest stock of hives. Suppose the casts weigh 15 pounds, say 22 shillings; thus, in the first year he has received back the price of his original hive, and dou-

bled his stock. The second year his two hives produce him four swarms and two casts; let him sell the honey his of casts at 15 shillings each, which will give him thirty shillings, and add the swarms to his stocks; he has now four good stocks; at the end of each year let him weigh his hives and take all the comb over thirty pounds; say eleven pounds a year from each hive; this gives him forty pounds of honey comb, at one shilling sixpence, gives him three pounds; this added to the profit, or the two casts as before, gives four pounds ten shillings. The third year his four hives produce four swarms and four casts; he goes on as before, and on the fourth year his apiary consists of eight stocks. At the beginsning of the fifth year, his apiary has increased to sixteen stocks.

From the above statement let him who is, or would be an apiarian, or keeper of bees, calculate the actual profit.

The profit which is obtained from the bee, bears no proportion to the little trouble and time required to their culture, which should induce more of our farmers to engage in the business, as but very little expence of time or property, and no extensive capital is necessary.

"As a proof of the importance attached to the culture of the Bee, Wildman quotes a modern author, who affirms that when the Romans took possession of the Island of Corsica, they imposed a tribute of wax on the inhabitants, to the amount of 200,000 pounds annually; supposing the island retained the same quantity, that would give 400,000 pounds per annum made in one Island by this wonderful insect. The known proportion of wax to honey in a hive is as 1 to 15 or 20; then multiply 400,000 pounds by 15 or 20, we have six or eight millions of pounds of honey, independent of the wax as above." Linneus, in speaking of the bee, says it is not yet determined if the bees, and other insects which feed on honey, occasion any injury to the little embryos, or cause any destruction to their generation, by imbibing the nectar of the flowers." It is obvious that the Bees afford immense profits to the cultivators.

and that too with very little expence and trouble, and without any injury to the vegetable kingdom. It must therefore, be from either a want of knowledge or attention to this branch of rural economy, that America has hitherto derived so little share from the profits of this wonderful insect.

THE MANUFACTURE OF METHEGLIN.

A hundred pounds of honey is generally used to make a barrel of this liquor; ninety has, however, been found to answer very well. The liquor is thus made. Take of honey and clear water, in the above proportions, and boil them for an hour; when the liquor is cool, barrel it, adding some ginger, cloves, and mace. if you would improve it, though it will make a good and delicious beverage without. Some yeast is to be put into the cask to ferment it; and let it have a little vent while fermenting, but close the vent as soon as most of the fermentation is over. It may be improved by bottling it, after five or six months.

MANUFACTURE OF MEAD.

Mead is a beverage prepared of water and honey. There are three distinct kinds of Mead, the simple, the compound, and the vinous. Simple Mead is made of water and honey, which does not undergo fermentation. Compound Mead is mixed with fruits and essences, in order to give it a flavour. Vinous Mead is made of honey and water which is subject to fermentation. Simple Mead is made by boiling three parts of water to one of honey; the honey may be increased or diminished to the taste. The process is over a slow fire until one third is evaporated, then skimmed and put into a cask, until the cask is full. After three or four days it will be fit for use. The cloths, which have been used in filtrating the honey from the combs may now be used and cleared from their honey in the boiling mead.

To make Compound Mead, during the boiling process of simple mead, add half a pound of raisins, stoned and seeded, to six pounds of honey, or four pints of water; boil these well together until the raisins become soft, and the four pints are wasted, to two; strain this liquor through linen. gently, and mix it with your mead, and let them continue to boil; add to the boiling mead a toasted crust of bread steeped in beer. Skim the mead again; remove it from the fire and when cool, barrel it as in simple mead, with an ounce of the salt of tartar dissolved in a glass of brandy. Let the barrel be full, that the froth may work over, and continue to fill, as the barrel diminishes by working. When this subsides, bung close and stow it away in your cellar; after a few months it will be fit for use. To give a variety of flavors to this mead, a few drops of the essence of cinnamon may be mixed with the salt of tartar and brandy; some lemon peel, syrup of gooseberries, cherries, strawberries, or aromatic flowers, according to the taste of those who are to use it.

Vinous Mead is said to be the beverage of all the northern people of Europe. The Russians complete their mead with honey, cherries, strawberries, goosberries, and mulberries; they soak these fruits several days in clear water, to which they add some virgin honey, and a piece of bread soaked in beer. The barrels are placed in a room 18 to 25 degrees of heat, day and night. The fermentation commences in six or eight days, and lasts about six weeks, spontaneously; it is then fit for use, but increases its value by age.

The French imitate with Mead the choicest wines, such as Malaga, Rota, Muscat, Constantia, &c. The beverage is said not to be unhealthy.

It may be considered that by substituting the delicious beverage of Metheglin and Mead for distilled liquors, an immense saving of health and expence may be made by those who, by habit, would make some kind of stimulating spirits, a necessary article of sustenance; it may also be the means of adding to the value of honey; by converting some part of it to those liquors for market.

THRESHING.

When the threshing of grain is performed with flails, it is slow and hard work. Farmers in some parts of our country thresh with a roller, which turns on a centre at one end, and which is small and confined to the floor at that end, by an iron pivot on which it turns, and the other end is large in proportion to the increase of the circle which it makes. It is drawn by a horse, and is usually of the length of about twelve feet. It is set full of little square pieces of wooden teeth, leaning outwards, with the ends cut off standing, agreeably to the surface of the roller. With this a man and horse, it is said, will thresh out about twelve bushels of wheat in a day.

Various threshing machines have of late been invented and put in use. Sir John Sinclair observes, that the threshing machine is considered to be the most valuable implement that modern times have produced, and states the following advantages as resulting from them. "1. From the superiority of the mode, one twentieth part more is gained from the same quantity of straw than by the old fashioned method. 2. The work is done much more expeditiously. 3. The grain is less subject to injury. 4. Seed can be produced without difficulty from the new crop. 5. The markets may be supplied with grain sooner in times of scarcity. 6. The straw softened by the mill, is more useful in feeding cattle. 7. If a stock of corn be heated, it may be threshed in a day and the grain preserved from injury. 8. The threshing mill lessens the injury from smutty grain. And 9. By the same machine, the grain may be separated from the chaff and small seeds, as well as from the straw.

The Edingburgh Encyclopedia, gives a description of a threshing machine invented by Mr. Meckle, which on a large scale, and driven by water, threshes, fans, and cleans wheat,

at the rate of sixty bushels an hour. On a smaller scale, worked by two horses and three hands to attend to it, this machine will thresh and clear sixty bushels of wheat, or double that quantity of oats, in eight hours. Rollers or small mill stones are added to many of these machines for crushing or grinding grain. Knives for cutting hay, he observes, might be added, Mr. Elihue Hotchkiss, of Brattleborough, Vermont, has invented and taken a patent for a threshing machine, from the Massachusetts Agricultural Society, in 1818. The Society likewise purchased the patent right for Massachusetts, and it may be found among the implements belonging to that Society.

A remark may be made relating to the threshing machine, which has been mentioned, that is applicable to the economy of all labor-saving machines; which is, that their object is not to encourage habits of indolence, or any exemption from those of the most indefatigable industry. Let all the labor be saved which can be effected by the intelligence and ingenuity of man, and still, in the progress of agricultural improvements, enough will be found to engage the whole attention, and give employment to all his energies. The most perfect state of agricultural improvements, is not to be expected, without the intellectual powers of man are called into action, to aid and facilitate his labors.

GENERAL REMARKS ON THE OBJECTS OF IMPROVING OUR
AGRICULTURAL ECONOMY.

The first object to be answered by efforts to increase the productive powers of the soil, is to promote the interest and increase the comforts of the present generation. Another, and perhaps not the least important one, is, to form the habits of posterity for encountering the evils of a crowded population. With respect to the first, it is very obvious, that if the farmer could obtain as much or more produce from one third or one half of the land he cultivates, whether it be fifty, an hundred, or any greater number of acres, and that too with the same expense of labor, he would thereby make a clear saving of capital to the value of the one half or two thirds of the land he possesses, which he might rent or otherwise dispose of. That he may make this saving of capital, is proved from numerous experiments. It is often observed, that those farmers in our country, who have the fewest acres, generally get the best living. They do actually derive more produce from their soil; and possess more of the comforts and conveniences of life. These spend their whole time, we will suppose, in cultivating their smaller number of acres; so also does he who possesses the larger farm. The farmer having smaller enclosures makes a saving in the article of fence, a less quantity of seed is required, a saving in the expense of ploughing, and a saving of taxes. Although the former does, and ought to spend his whole time in the cultivation of his soil, yet a much less capital is required to render his labors successful, than would be to cultivate one half, or two thirds more land. It is often, too, for want of sufficient capital, that the farmer who is ambitious of possessing a large farm, that he may appear to be rich, often fails of success; not having sufficient stock to work his lands properly, nor cattle enough to furnish manure, nor money to purchase the articles he ought to possess, to make

the cultivation of his soil profitable. For this reason we often see respectable, intelligent, and industrious farmers living in a state of penury and hard labor ; and at last, from some unfavorable seasons, and other incidental misfortunes, sinking under the weight of accumulated burdens.

There are, it is true, many farmers scattered over our wide extended country, who possess capital sufficient, and whose wisdom and industry enable them to cultivate extensive farms with success. But the establishments of that class of farmers by the policy of our government, are liable to be dissolved, to be subdivided among their descendants, and eventually among other citizens. It is to the wisdom and success of the small land owner, the common farmer, that our republic will eventually owe its prosperity, the dignity of its character, and the perpetuity of its privileges. The occupancy of many very large farms by individuals, can never be expected to characterise the prosperity of our republic. The value and respectability of our population will diminish in proportion to the unequal distribution of our lands.

But our farmers are continually hazarding the loss of the lands they possess, by cultivating so much, and in such a manner, that no one acre yields to them an adequate remuneration for their toil and expense. Their embarrassments consequently accumulate, untill they are forced to sell their farms to enable them to meet the claims of their creditors ; or if they are not driven to this extremity, they are often subjected to the evil of toiling through the year, without obtaining from their industry a competency to defray the current expenses of their living.

It is believed that on the same number of acres, the expense of raising a poor crop is generally nearly as much as that of raising a large one. There is the same expended in fencing—the same in taxes—the same quantity of seed sown—and perhaps nearly the same expended in ploughing—and the same, or more, labor in threshing ;—and generally, as much or more labor in the whole process of tillage.

These considerations, one would suppose, are sufficient to induce our farmers to improve their crops by a more thorough and skilful course of cultivation.

It is well known that there are men in our country who are intelligent and industrious, who possess perhaps from thirty to fifty acres of land, and yet are devoting their services to the concerns of their neighbors, for the avowed reason, that they cannot support their families on so small an extent of land. But they, and most other farmers in our country, have yet to learn the productive power of a perfectly cultivated soil. Instead, therefore, of seeking wealth by increasing the number of their acres, it is hoped they will be induced to seek it in better modes of husbandry. It is believed that, as a general truth, it may be said the farms throughout New-England, containing one hundred acres, were they divided into thirds, by quantity and quality, that each third might, by suitable cultivation, be made to produce more than the whole hundred acres do at present.

If the farmer, who barely subsists by toiling all the year on one hundred, or one hundred and fifty acres of land, thinks he cannot afford to expend a cent more on the tillage of an acre than he has been accustomed to do, let him enable himself to do it by saving it in fencing, leaving out some of his lands that bring him but little profit, by means of which he will have to pay less taxes on tillage land; or he may turn some of his tillage land to grass; and so bestow the same labor and manure on, say, a third less land in tillage.

If lands are naturally so unproductive, or so badly cultivated, as not to yield to the owner a reasonable profit for his labor and capital employed, it would be much better to abandon them altogether, or bestow more labor and manure on only a part of them, and let the remaining part be appropriated as a pasture for cattle or sheep.

A renovation in the general system of agricultural economy may not be expected until the habits of our farmers, formed

under the influence of tradition and prejudice, shall many of them be exploded ; nor until we shall begin duly to appreciate the importance of forming our own habits, as well as those of our posterity, for encountering the evils of a crowded population.

This consideration presents an object of vast importance. In the Eastern World, those evils have begun to press, when the habits and manners of the people were formed ; and so formed as to aggravate and increase, rather than to avert them. They probably were governed by the influence of the same error that we now are. The farmer who possessed only an hundred acres, and had a number of sons, did not think himself able to provide a competent agricultural establishment for only one. The others, if they were not educated for some of the learned professions, were either sent to the army, or engaged in commercial or mechanical pursuits, to depend for support on the casualties and caprice of customers ; or on the degrading and dependent employment of hired servants.

It is very obvious from a view of their present condition, that no calculation has been made throughout most of the kingdoms of Europe, to provide for the evils of a crowded population, by engaging the laboring class of their citizens in developing the utmost productive resources of their soil. For while they have vast forests, as well as extensive tracts of valuable land lying in an uncultivated state, not more than one sixth part of her population is employed in practical agriculture, and a great proportion of it doomed to the most abject state of servitude and penury.

The American people are too much inclined to form the habit of the rising generation for other than agricultural pursuits ; too many had rather see their sons engaged in some speculative pursuits, by which they may chance to live, without the drudgery of the field, rather than settle down on fifteen or twenty acres of land, to "seize the plough and greatly independent live." We have in our republic too many professional

men, too many mechanics, too many commercial men, and too many soldiers; as well as too many who, by the policy of our government, or the indulgence of their fathers or guardians, are permitted to waste the vigor of their youth, without any ostensible object of pursuit, which may prepare them for usefulness.

In this state of things our larger farms are not cultivated as they ought to be, and our small ones, though well cultivated when in the occupancy of wise and industrious husbandmen, yet are frequently almost entirely neglected, because they are not supposed to be large enough to make their cultivation a sufficient object. It has been remarked that farmers are often ruined because they have too great plenty of land in their possession. This may be true, but there is no reason why it should continue to be so any more than that being rich should necessarily make a man poor. The man who possesses much land, should clear and improve no more than he can cultivate to advantage.

The author of these essays does not pretend that new theories will give to agricultural operations any sudden and extraordinary impulse, in the developement of national or individual resources. Nature has given nothing to man without labor. The truth of this has been attested by the efforts which were necessary in compiling this small volume; in which, however judiciously the information it contains, may appear to have been selected, it presents only an introductory view to a science, in the pursuit of which, we may expect to make, indefinite progression. Notwithstanding how much may be attributed to the expediency of studying agriculture as a science, it is believed that it is not so much for the want of knowledge or of theories, as of attention, of proper emulation, of industry, and economy, that it is not yet in a condition as much improved and prosperous as it probably would be, and as it should be, if we would act with a wise reference to the interests of our posterity, and of our country.

One important object of recording the discoveries and experiments of agriculturalists, may be to put farmers upon thinking about their proper business, and to excite emulation among them, so as to call into action the talent and resource they possess. When this is accomplished, we may confidently expect all other obstacles to the progress of the science will be removed.

MANUFACTURING THE SAP OF THE MAPLE.

The manufacturing sugar from the maple, is an important item in the system of domestic economy. And as our young men are often engaged in clearing our forests, it is important that they are not only apprised of the importance of preserving the sugar maple, but that they should understand the process of making the greatest profit from its juices.

SEASONS FOR TAPPING. By trials made in the month of February, it will readily be discovered when this valuable tree ought to be bored, for the purpose of extracting the sap, as in that month either earlier or later, according to the season, it generally begins to yield a sufficient quantity for commencing the business.

TAPPING OR BORING. Four hundred trees, each bored with two holes, as nearly as may be on the south side; and also with two holes on the north side of the tree in the early part of the season, with screw augers, from two to four quarters of an inch, according to the size of the tree; and towards the middle of the season, a like number of trees to be bored in the same manner, is recommended as a better mode for the management of four hands, than if the whole number of eight hundred trees were tapped at the first running of the sap. This calculation may of course be varied according to the number of trees, or hands employed. The sap of the second parcel tapped, will be found richer, and more productive than if a part had been extracted earlier. The auger should enter the tree at first, not more than three quarters of an inch: the holes may at several times, be deepened to the extent of two inches and a half, as the manner of the sap running may render necessary. The hole should be made slanting or descending, so that the sap may run freely in frosty weather, and not by a slow motion

be liable to freeze in the mouth of the orifice. In these holes spouts should be fixed, to project from the tree, from eight to twelve inches, and not to enter the tree more than about half an inch; as the farther they enter the more the running of the sap is obstructed; they should be prepared, in readiness for the season, of elder and sumach.

PRESERVING THE SAP. In the early part of the season the sap will keep two or three days without injuring; but as the spring advances, it will be necessary to boil the sap the day after it is collected, or it may ferment and sour. *Lime.*—To every half barrel, or fifteen gallon kettle, a tea spoonful of slacked lime should be put in, while the sap is fermenting, and before it boils: this promotes the rising of the scum and forming of the grain. *Boiling.*—A smart fire should be kept up, while the sap is boiling. As the scum rises, be careful to skim it off. When the liquor is reduced one half in quantity, lade the second kettle from the end into the end one, and when the contents of three or four kettles can be contained in one, let the whole be laded into that, at the end; filling up the empty kettles without delay, with fresh sap. As the liquor in the end kettle, removed from those which have been mentioned, becomes a syrup, it should be strained through a good blanket or woolen cloth; and care must be taken not to suffer it to boil so long as to be too thick to be strained in this manner. It should, when thus cleansed from its impurities, stand in buckets or other suitable vessels, twelve hours or more, that the particles of lime, and other remaining sediment may settle to the bottom; after which it should be so gently poured off into a kettle or boiler, as not to carry with it any of these settlings. However they need not be wholly lost, they will mostly contain a considerable quantity of sugar and syrup; by pouring fresh sap on them, stirring them well together, and suffering them to stand a while to settle, a great part of the valuable sweets contained in such sediment may be saved. It may be further noted, that when the sap is weak,

which is generally the case toward the latter part of the season, it requires more boiling, and a higher proof, than that collected earlier and of greater strength.

The above method, on actual experiment, is said to have answered well; but a judicious sugar boiler believes, that it would be best to avoid letting the syrup stand twelve hours after being strained through a blanket: when the process is begun, the sooner it is completed, in his opinion, the better; the design of its so standing for twelve hours being chiefly intended to give sufficient time for the particles of lime and other sediment to collect at the bottom of the kettle. It is proposed that lime should be mixed with a quantity of fresh sap in the evening, and be well stirred; the large particles of lime in this case, will be likely to subside before morning, and the clear sap so impregnated, may be mixed the next morning, in proper proportions, in the several kettles, observing however, that in this mode, more lime will be necessary, as less of its strength will be extracted by cold than by hot water.

GRAINING. The syrup having stood twelve hours or upwards, then to be gently poured into a kettle or boiler, as above mentioned; which would be best placed over a fire made of charcoal, as before hinted; unless the kettle is so fixed in a furnace, or in such a situation that the flame can be confined to the bottom; for if it be suffered to pass on the sides, it endangers the syrup's being burned. This operation should also be performed with a smart fire, to be uniformly and equally kept up, in which, as well as in boiling the green sap, the use of butter, hog's lard, and other fat, is not only very useful and advantageous; but absolutely necessary. When in the course of boiling, the sap rises towards the top, a piece of fat equal in size to a small nutmeg thrown in, will keep it down. Particular care should be taken by these means to prevent the rising of the syrup when grain-ing, which may require a larger proportion of butter, &c. It is found that the evaporation is much more expeditious, and it

is believed that the quantity of sugar made is larger, when a careful guard is kept up to prevent the sap, and particularly the syrup when graining, from rising, by the timely introduction of a piece of fat as above described. To form a judgment when the syrup is sufficiently boiled, take out with quickness the stirring stick which is constantly kept in the boiler for the purpose of taking the proof, rub some of the syrup off the lower end of it with the thumb, and if on applying the finger thereto, it draws into a thread, it may be deemed in a proper state to be laded into a tub or cooler. Then it should be forthwith, and incessantly stirred with a stick about three inches broad, until the grain can be felt between the finger and the thumb, when it is in a fit state to be poured into the moulds.

It requires much practical information, and the exercise of sound discretion, to determine from the different appearances of the syrup in the time of boiling, the moment when some material movements, or changes ought to be made.

Claying, or whitening the Sugar. To promote the molasses passing more freely from the sugar, when draining in the moulds, and to improve its color, in two or three days after the moulds are unstopped at the lower end, mix white clay with water, so as to reduce it to a thin mortar; with this cover the top of the moulds one inch and a half thick: when this covering appears dry, remove it, and supply the place with a fresh covering of about two inches thick.

Although it is apprehended the use of clay, as above set forth, particularly in the latter part of the season, will be found beneficial, it may, however, be prudent to continue or decline the practice, according to the effect or use it appears to be of, on a careful trial; the quantity of clay must be proportioned to the manner in which the sugar has been boiled; if high boiled, it will require much more clay than if boiled low. It is also thought the use of clay lessen the quantity of

sugar, perhaps one fifth part, and may be more or less according to the knowledge of the person who undertakes the business. It may be also remarked, that if the quantity of sugar be lessened in weight by claying, one fifth part, it is not to be concluded that the whole of this fifth part will be eventually lost; there will be more syrup than there otherwise would have been, independent of the water from the clay that passes through the sugar

MOLASSES AND VINEGAR. When the trees of the second tapping become poor in quantity and quality, which may be about the tenth of April, or perhaps sooner, then the number of fresh tapped trees will yield a sap of which may be made good molasses, and also excellent vinegar. In all sugar plantations, it will be advantageous to cut out the different sorts of timber which grow intermixed with the sugar maple, and even those of that species which are not thriving, promising trees. The timber so cut out will serve for fuel for the boilers, and leave greater openings for the rays of the sun to enter, which have a tendency to improve the value of the remaining trees. The ground so cleared of all except the maple tree, it has been observed, is particularly favorable for pasture and the growth of grass.

It appears not to be ascertained, that this tree becomes impoverished by repeated tappings. There are instances, particularly among the old settlements on North River, of trees which have been tapped for fifty years or upwards, and continue to yield their sap in the season, equal to any brought into use of later time. It is asserted with confidence by some, that those trees by use become more valuable, yielding a sap of a richer quality.

The above account from the Encyclopedia, may aid the inexperienced manufacturer of sugar, until he may by practice, discover other and more perfect modes.

It is said all sorts of maple may be propagated by cuttings. And that if they be cut from the trees before the buds begin to

swell, and before the ground be fit to receive them, they may be wrapped in moss, and put in a cool place where they may be kept a month or five weeks without injury. The trees may also be propagated by sowing the seeds commonly called kegs.

FINING MAPLE SUGAR.

THE following account from Memoirs of the Board of Agriculture, N. Y. relates solely to the operations of reducing the syrup to sugar. When the syrup is reduced to the consistence of West-India molasses, set it away till it is perfectly cold, and then mix with it the clarifying matter, which is milk or eggs; the latter are said to be preferable, because when heated, the whole of it curdles; whereas milk produces only a small portion of curds. The eggs should be thoroughly beaten and effectually mixed with the syrup while cold. The syrup should then be heated till just before it would boil, when the curd rises, bringing with it every impurity, even the coloring matter, or a great portion of it, which it had received from the smoke, kettles, buckets, or reserviors. The boiling should be checked, and the scum carefully removed, when the syrup should be slowly turned into a thick woolen strainer, and left to run through at leisure. It is remarked by the author of this account, that a great proportion of the sugar that is made in our country, is not strained after cleansing; which he thinks is an error. And observes, that if examined in a wine glass, innumerable minute, and almost imperceptible particles of curd, will be seen floating in it, which, if not removed, render it liable to burn, and otherwise injure the taste and color of it. A flannel strainer, he observes, is not only better than a linen one, but is indispensable. One pint of eggs to a pailful of syrup is amply sufficient; and half as much will do very well. The syrup is then put into another kettle, which has been made perfectly clean and bright, when it is placed over a quick, but solid fire,

and soon rises, but is kept from overflowing by being laded with a long dipper. When it is sufficiently reduced, (which may be ascertained by dropping it from the point of a knife, while hot, into one inch of cold water—if done, it will not immediately mix with the water, but lies at the bottom in a round flat drop,) it is taken from the fire, and the foaming allowed to subside. A thick white scum, which is useable, is removed, and the sugar turned into a cask, placed on an inclined platform, and left undisturbed for six weeks or longer, when it should be tapped in the bottom, and the molasses drawn off. It will drain perfectly dry in a few days.

The sugar made in this way is said to be very nearly as white as lump sugar, and beautifully grained. It is observed by the same writer, that two hands will sugar off 250 pounds in a day. And that from the scum taken off in cleansing, he usually made, by diluting and re-cleansing, one sixth as much sugar as he had at first, and of an equal quality.

It is not, he observes, of much consequence, as it regards the quality of the sugar, whether care be taken to keep the sap clean or not. The points in which the greatest error is committed, are, neglecting to use a flannel strainer, to strain after cleansing; to have the sugaring kettle properly cleansed; and to remove the white scum from the sugar.

SOWING.

Some remarks have been made in these essays on the subject of sowing, or properly covering seeds committed to the earth ; but as it is of great importance that this process is correctly understood and practiced, the following remarks on this subject, from the New-England Farmer, are too pertinent and interesting to be omitted.

“There are three ways of seeding the ground : 1, in hills, as it is called, or in squares ; 2, in drills, or continued rows ; and 3, in the broad cast method, or at random with a cast of the hand—which last method is always termed sowing. The first requires the least quantity of seed, the last the greatest. But the crops will not be in proportion to the different quantities of seed.

With regard to sowing, several things ought to be attended to ; the quality or goodness of the seeds, the time of sowing them, the depth that is best for them, and the quantity or proportion of seed to the ground.

The quality of the seed should be ascertained, in order to determine the quantity that is proper to be sown ; for if one tenth part of the seeds, for instance, should be destitute of a vegetative power, a tenth part more of such seeds should be sown than the usual quantity, supposing the seeds to be in perfection.

In order to determine the goodness of the seed to be sown, you should previously take fifty grains, at random, from the parcel ; sow them in good mould, at a proper depth, and carefully observe how great a proportion fail of coming up. They may be sown in a pot, and kept in a warm part of the house, or in hot bed, that the farmer may have timely notice of the quality of his seeds, when it is too early in the spring to do it in the open ground. Many have missed of a crop, by not taking this precaution. When seeds are suspected of being too

old to vegetate, this previous trial should by no means be neglected.

But if we wish to have seeds in the best condition for sowing, they should be well ripened on their plants, before they are gathered in; afterwards they should be kept perfectly dry, that they may not contract the least mouldiness; and never be secluded from the air. Mr. Miller found that air was absolutely necessary to maintain the principle of vegetation in seeds. Having saved a parcel of fresh seeds, of several kinds, he took some of each, and sealed them up in glass phials; the other parts of the same seeds he put into bags, and hung them up in a dry place, in a free air. After a year had passed, he took some of the seeds from each phial and each bag, and sowed them at the same time, and on different parts of the same bed. The result was, that almost all the seeds he took out of the bags grew well, but of those which had been kept in phials not one came up. His discovery was further confirmed by experiments afterwards. How careful then should both farmers and gardeners be, that no seed designed for sowing, be kept totally secluded from the air.

All kinds of seeds are best kept in their pods or husks; especially they should be so kept when they are designed to be transported to distant countries or places.

Accordingly some of the best writers recommend the lying of seed wheat in the sheaf, to the time of sowing. And that none but the best of the grain may be sown, instead of threshing, it is advisable to strike a handful at a time gently against a post, and collect what falls out; because the heaviest and best grain is always the most easily detached from the ear.

Being furnished with good seeds, the time for committing them to the earth must in a great measure be determined by the judgment of the experienced husbandman; because, from various circumstances, it comes to pass, that the true time admits of some latitude. The time for spring sowing will vary according to the variation of the forwardness of the season;

which may be best determined by the respective forwardness of trees and shrubs.

That great naturalist, Linnæus, did not approve of farmers confining themselves to certain set days or weeks, for committing their seeds to the earth. The seasons are much forwarder in some years than in others. He, therefore, recommends to his countrymen, as a better practice, to take notice at what time the trees unfold their leaves. Nature is so uniform in her operations, that the forwardness of trees is an unfailing indication of the forwardness of the spring. And the genial warmth, which causes trees and shrubs to put forth their leaves, will be sufficient to cause seeds to vegetate.

It would be desirable, if gentlemen would keep and regularly publish a record of the flowering of plants, according to the example exhibited in the following account of the leafing and blossoming of trees and shrubs, which was taken in that part of New-England which lies in the 44th degree of latitude, in the spring of the year 1789.

	<i>Leafing.</i>	<i>Blossoming.</i>
Gooseberry - - -	April 16.	May 12.
English Willow - - -	28.	
Wild Red Cherry - - -	29.	19.
Lilac - - -	30.	
Currant - - -	May 1.	9.
Alder - - -	5.	
Apple-tree - - -	6.	25.
Thorn-bush - - -	7.	
White Birch - - -	8.	
White Maple - - -	9.	
Beech - - -	10.	
Plumb-tree - - -	12.	
Hazle - - -	14.	
Elm - - -	15.	
Summer Pear - - -	17.	31.
Common Red Cherry - - -	19.	20.
Damascene Plumb - - -		22.
Grey Oak - - -	20.	
White Oak - - -	23.	

But there are other circumstances to be taken into the account which may further vary the season for spring sowing. A light warm soil may receive the seeds earlier than one that is strong and moist. The former will arrive to the right degree of dryness sooner than the latter, and is earlier fit for the operations of tillage. And this is certain, that seeds that require the earliest sowing, must not be sown before the earth can be well pulverized. Neither should plants that are easily killed by frost, be so early sown as to be up till the spring frosts are past.

If seeds are sown too early, or when the ground is too wet and cold for them, they will either perish or fail of coming up; or if they come up, it is slowly, so that the plants become stunted in their growth, and never arrive to a full size. If the right season for sowing should elapse, the husbandman may accelerate vegetation by steeping the seeds in a ley of wood ashes, or other proper monstrium, so that they may overtake in their growth those which were sown in the right season.

The depth at which different seeds should be buried in the soil, is various, according to the difference in seeds and soils. M. Duhamel found by experiment, that but few seeds will come up at all, when buried deeper than nine inches; that some seeds rise very well from the depth of six inches; and that other seeds do not rise at all when they are more than two inches under the surface. And in general, those seeds the body of which are thrown above the surface in vegetating, should have the less quantity of soil above them, that they may not meet with too much resistance in rising; such as kidney beans, and many other sorts. Also the same may and ought to be buried deeper in a light and dry, than in a heavy and moist soil. When the ground is rolled after sowing, the seeds will vegetate the nearer to the surface. And therefore they do not need to be sown so deep as when the rolling is omitted. To determine what is the right depth in a doubtful case, Mr.

Tull has suggested an excellent method: Take a dozen of sticks for guages; mark the first at half an inch from the end: the next at an inch; and so on, increasing half an inch to each. Then in the sort of ground you intend to sow, make a row of twenty holes, with the half inch guage; put in twenty good seeds and cover them, and stick up the guage at the end of the row. Then do the like with the rest of the sticks. Observe how the seeds prosper in the different rows, and you will discover at what depth that kind of seed should be buried. This experiment, however useful, can be of little or no use in the old field husbandry; for in the broad cast way of sowing, the seeds will be differently covered. But sowing fields with the drill, in equi-distant rows, when horse-hoeing is not intended, cannot be too much commended, if it were only on account of the seed that may be saved by it. Much seed is wasted in the common way of sowing. For some of the seed will be so deeply covered that they will not vegetate; some will be left on the surface, which is a prey for birds, and perhaps leads them to scratch up some of the rest: some will lie so near the surface as to be destroyed by variation of weather, being alternately wetted or scorched. And of those seeds that grow, some rise earlier and some later, so that the crop does not ripen equally. The seeds will fall from the hands of the sower too thick in some spots and too thin in others, by means of the unevenness of the surface; and the harrowing will perhaps increase the inequality, so that many will be so crowded as to be unfruitful, while the rest have more room than is necessary.

But when the seeds are put in with the drill, they will rise nearly together; not so much so as one seed will be wasted or lost, supposing them sown at the right distance; each one may have so much room, as is most conducive to its growth; no starved head will appear, and the whole will ripen together. Half a bushel of wheat, or even a less quantity, in this way will seed an acre sufficiently; which would be a great advantage at a time of scarcity of seed.

It is difficult to determine the quantity of seed that is best to be sown in the broad cast way. Doubtless it should vary according to circumstances. When seed is very large and full grown, two bushels may not be more than equal to one that is small and pinched, suppose the seeds equally disposed to vegetate, which is often the case. For the true quantity should be estimated, rather by the number of grains, than by measure or weight. Not that pinched grain should be sowed except in case of necessity. For it may be expected that the most perfect seeds will produce the best plants.

Rich land will afford nourishment to a greater number of plants than that which is poor. But if by furnishing more nourishment it will increase the number of sprouts from a single seed, then it may be supposed in some cases of sowing, a less quantity of seed would produce more plants on such land than could be cultivated successfully on that of a poorer soil. Therefore, the proportion of seed sown on a rich or poor soil, must be determined by the nature of the seed, as well as the relative strength of the soils.

The sowing of winter grain is perhaps a more difficult matter to manage rightly than vernal seeding. Mr. Deane thinks farmers mistake their interests when they persist in sowing winter grain at a certain time of the year, let the weather be ever so hot, and the ground be ever so dry. By heat and dryness the seeds will sometimes be so scorched in the soil, that not a fourth part of them ever come up. Therefore, if a drought happen at the usual sowing season, it will be needful to defer sowing till some rain has fallen, and the soil has got a due degree of moisture. How long it may be best to wait for such a favorable opportunity, must be left to the judgment of the experienced farmer. Also, a spot that has been newly cleared by burning, may be sown later in autumn than other land. It ought to be sown later, if the growth before winter be wished to be only equally forward; for the ashes will so quicken the vegetation, that if it be seeded early, it will attain to too large

a growth before winter. It is, however, believed by many, that early sown grain is not so likely to be injured by the frosts, which are more likely to disengage, and throw out of the ground, and thereby destroy the roots of grain of less size and strength than those of earlier sown grain. But, perhaps it will be found to be a good rule, to sow grain the earlier, in proportion as the winters are longer and colder. But it cannot be judicious to confine the true time to certain days or weeks.

The experience of persons in other countries may mislead us, it is therefore greatly to be wished, that a set of the most accurate experiments were made by some judicious persons in this country, in order to ascertain the best time for autumnal sowing.

CHEMICAL TERMS EXPLAINED.

Gas. All the airs, or vapour separated from bodies by means of heat or any chemical process, if they differ in their properties from the air of the atmosphere, are called gasses.

Carbonate of Lime. This substance, under the name of marble, chalk, limestone, &c. exists in great abundance variously mixed with other bodies. It is often found chrystilized, and perfectly transparent. It has scarcely any taste. It is insoluble in pure water. See Bergman, 1st. 26, for further explanation.

Calcareous. A term used to describe chalk, marble, and all other combinations of lime with carbonic acid.

Carbonic Acid. A combination of carbon and oxygen.

Carbon. The basis of charcoal.

Oxygen. A simple substance, composing the greatest part of water, and part of atmospheric air.

Argillaceous. A term descriptive of those earths which contain alumine, or clay.

INDEX.

A

	<i>Page.</i>
Agriculturalists compose four classes	13
Agriculture not made the sole object of pursuit	13
Unless it is, will never arrive to its most perfect state	13
The rapid extension of our settlements to the west and south has not increased the aggregate of wisdom and happiness among the American people	13
The evils of a crowded population have never yet been aver- ted in any country to the extent which the science and the practice of agriculture would admit	16
Whether they may, remains to be decided by the American people	16
If we would perpetuate the duration of our civil privileges, we should consider agricultural pursuits the most honorable and fashionable among the sciences	19
The principles of agriculture are uniform and universal in their operations, and it is the business of the farmer to vary the application of them according to the nature and con- dition of the soil he cultivates	20
The Greeks supposed a competent knowledge of the science of agriculture should embrace the experience and the phi- losophy of the whole age in which they lived	23
Several of their celebrated philosophers left useful instruc- tions on the subject of agriculture	23
The occupation of agriculture will never be elevated to that dignity which it merits, so long as it is considered a mere menial exercise, unworthy the efforts of intellectual capa- city	23
Ashes—their efficacy as a manure	39
Asparagus—remarks on its use	242

B

Buckwheat does not require a very fertile soil	109
May be raised in succession on the same ground	109
Proper time for sowing	109

	<i>Page.</i>
Buckwheat and spring rye, may be sown and raised together - - - - -	109
Remarks on its culture and value - - - - -	109-110
Bees—where the hive should be placed - - - - -	176
Method of managing bees - - - - -	176
Other methods described - - - - -	177
Directions for feeding bees - - - - -	177
To preserve bees from the worm, or butterfly - - - - -	178
Method to save them from being killed with the frost or cold - - - - -	178
Bog meadows—method recommended for draining - - - - -	203
What crops may be successfully raised on them - - - - -	203
Bean, garden, mode of cultivation - - - - -	244
BEES—dysentary a disease of - - - - -	253
Cause and remedy - - - - -	253
The various enemies of bees described - - - - -	254-5
The profits of bees, a calculation on - - - - -	257

C

Clay—its use and properties particularly explained - - - - -	28
Its capacity for absorbing and retaining moisture no antidote against drought, when existing by itself, unmixed with sand or other substances - - - - -	29
Clay, most efficacious in promoting vegetation when thoroughly pulverized and mixed with sand and vegetable or other manures - - - - -	29
Carbon—its nature and properties explained - - - - -	36
Cattle—a general term for domestic animals - - - - -	58
Corn—remarks on the varieties of - - - - -	75
A change of seed necessary to secure the best crop - - - - -	75
Remarks on the changes of seed corn - - - - -	75
Remarks on the proper time for planting corn - - - - -	75
Corn, said not to be an exhausting crop - - - - -	76
Remarks on the particular value of corn - - - - -	76
Remarks on the soil proper for corn - - - - -	77
Remarks on the best method of planting corn to secure the largest crop - - - - -	77
The drill recommended in planting corn - - - - -	78
Cider—remarks on preparing the fruit for making cider - - - - -	119
Casks, open headed said to be the best for the first fermentation of cider - - - - -	119
Remarks on the fermentation of cider - - - - -	119
How to prevent the fermentation of cider - - - - -	120
A method to refine cider - - - - -	120
A method to clarify cider - - - - -	120

A method to prevent cider from becoming pricked, or cure it when it is so	120
An opinion that cider should be boiled when it comes from the press, if ever	120
Reasons why more attention should be given to the improvement of cider	121
Remarks on the qualities of the Virginia crab apple for making the best cider	121
To make good cider great attention to the fermentation indispensable	122
CARTS—for one horse recommended	133
CATTLE NEAT—Our neat cattle possess all the valuable properties which distinguish the various breeds in Great Britain	146
What is to be regarded in the selection and improvement of our breeds of cattle	147
Various breeds of cattle in Great Britain described	147
The wild race of Great Britain	147
The Devonshire—the Dutch—the Lancashire—and the Highland or Sheylæs	147
The Polled—the Alderney or French—and the Welch	148
Objections to importing bulls and cows from Great Britain to improve our breed	148
How we may improve our breed of cattle	148-149
Cow—a description of a perfect one	149
Signs of a good ox	149
CALVES—rules to be observed in raising	149
Mismanagement in selections for raising	149
HEIFERS—time they arrive at the age of puberty	149
Crossing—rules to be observed in improving the breed by crossing	150
English breed of neat cattle, to what their superiority is principally owing	150
Mode of keeping their neat cattle	150
An opinion respecting the cause of their diseases	151
Calves—a particular mode of raising them described	151
Another mode described	152
What pasture best for calves after weaned	152
Neat Cattle—what keeping necessary to increase their size	154
Remarks on the value of roots in feeding cattle	154
Mr. Curwen's remarks on the value of turnips as food for neat cattle	155
Diseases of neat cattle	155
Hoof ail—horn distemper—soil sickness	155
Gripes or cholic in neat cattle	156
Scouring symptoms in neat cattle	156

	<i>Page.</i>
Hoven, a disease in neat cattle	156
Staggers	157
Overflowing of the gall	157
Pantasie	157
Inflammation of the liver	158
Inflammation of the lungs	158
The lock jaw	158
Garget	159
Puerperal	160
Canker worms—Caterpillars	179
Canada thistle, remarks on	222
Chesnut tree—the effect of its shade on vegetation	130
COMPOST MANURE—remarks on	42
Method to provide compost recommended	42-43
Various ingredients valuable for compost manure	42
Cale—its use and cultivation	247
CABBAGE—remarks on the cultivation of	247
Method of preserving them	248
Different varieties of, and relative value of each	248
Cucumbers—method of cultivating them	249

D

Diseases of neat cattle	155
DAIRY—in managing a dairy successfully attention to the quality of the milk necessary	192
The last drawn milk. or strippings, the most valuable for dairy	192
Remarks on the quality and management of milk	192
Remarks on the process of making butter	193
Mode of preserving and improving butter, recommended by Doct. Anderson	194
Mode of managing milk so as to increase the quantity of cream	195
Feeding cows on sainfoin will be greatly increased	195
Process of making cheese	295-6
Simple method of making cheese practiced in England and America	197
General remarks on the management of a dairy	198

E

EXPERIMENTS—the advantages of	233
How made without hazard	233
In what branches of husbandry experiments should be made	234
Too much confidence not to be placed in single experiments, the reasons why	234
Experiments should be recorded	234
A successful experiment in raising wheat and potatoes, account of	222-3

F

	<i>Page.</i>
FALLOW—the term explained	56
Objections against the usual practice of summer fallowing	56-7
Utility of substituting rotation of crops for summer fallow	57
What crops should be cultivated as a substitute for summer fallow	57
When substituting rotation of crops for summer fallow may be dispensed with or omitted	58
FLAX—remarks on the objections to this crop	80
Diversity of opinion respecting the exhausting nature of a flax crop	81
Preparation of the soil for a flax crop	80-1
Causes of the fineness of the Irish flax	81
Different causes that affect the quality of flax considered	81
Different modes of rotting flax	81-2
Salt, said to be a valuable manure for flax	82
How seed for a flax crop should be prepared	82
Proper time for pulling flax	82
FRUIT TREES—remarks on planting and pruning fruit trees	112-3
What culture of land best promotes the growth of fruit trees	113
Farther remarks on pruning fruit trees	116
Diseases of fruit trees	116-17
Degeneracy of our apple trees	117
FENCES—remarks on hedges for fence	126
Method for making hedges for fence of the white mulberry, recommended	126
The thorn, the apple, and the willow most used for the purposes of hedges	127
Method to raise the thorn from the seed	127
Method to make hedges for fence from apple seeds	128
Objections to hedges for fence considered	128
Ditches for fence	128
Directions for making the hedge of the willow	129
Mr. Silliman's remarks on hedge rows	129
Reasons for introducing hedges in some parts of our country	130
Flooding land—trees and useless plants killed by flooding land	204
General remarks on the advantages of flooding land	205
Farmers—the bad economy of many, and the consequences	265
The wisdom and success of the common farmer will eventually characterize our republic, and tend to its perpetuity	265
Farmers not enough inclined to form the habits of their sons to agricultural pursuits	267
Farms in New England generally too large for the benefit of the proprietors	266

G

	<i>Page.</i>
GYP SUM —its constituent properties explained	40
Its different efficacy on different soils	40
The quantities which have been thought best to be used	40
GRASS —the importance of breaking up old grass to improve the soil	47-8-9
Remarks on	50-1
Grasses artificial—what we are to understand by them	96
Improvement of the soil by cultivating artificial grasses	96
Other advantages resulting from the culture of artificial gras- ses	96
Comparative value of artificial grasses and those which grow without cultivation	96-7
Lucern an artificial grass described	97-8
Sanfoin and Burnet	99-100
Cichory or wild Scurvy	100
Spuny, the bush vetch, and tares	100
The broad leafed vetch, or everlasting tare	101
The tufted vetch, or tare	101
The strange vetch	101
Clovers—varieties and culture of	101-2-3
Mr. Young's opinion respecting the proper quantity of differ- ent grass seeds to be sown on an acre	102-3
Natural meadow land	103-4
Grasses called natural, because they will grow longer with- out cultivation—herds grass	104
Meadow fox tail and meadow fescue	105
Darnel, or ray grass	105
Crested dogs tail	105
Meadow grass, and vernal or spring grass	106
Sheep's fescue and hard fescue	106
Annual meadow grass	106
Rough stalked meadow grass	106
Fowl meadow grass	106
Flat stalked red meadow grass, and creeping beni grass	107
Silver hair grass, and tall oat grass	107
Yellow oat grass, rib grass, and cock's foot	107
Blue dog's tail grass	108
Aquatic plants or grasses—fote fox tail	108
Water hair grass, or red meadow grass	108
Garget—disease in cows	159
Grubs	180
Garden flea	182
Grasshoppers	182
Grub and wire worm	182
GARDENS —general remarks on the advantages of	241

	<i>Page.</i>
Divisions and plan of a garden	241
Plants usually cultivated in gardens, as beets, carrots, parsnips, &c.—observations on the cultivation of	242
A table cannot be well furnished without attention to gardening	251
Observations of European travellers relating to this subject	250
Gardens useful for trying various experiments	252
The utility, convenience, and economy of gardening, claim the farmer's attention to this branch of husbandry	252

H

HEMP—remarks on the advantages of cultivating	83
The soil proper for a hemp crop	83
What quantity of seed requisite to the acre	84
The seed should be of the next preceding year	84
How the seed should be prepared	84
What time the seed should be sown	84
Harvesting hemp, and getting off the seed	84
Different modes of rotting hemp	85
Wheat may be raised successfully after hemp	85
The policy of raising our own hemp for commercial and naval purposes	85
HOPS—soil proper for hops	93
The particular mode of planting and cultivating hops	94
Proper time for harvesting hops	95
Method of preparing and securing them for market	95
Economy of raising hops	95
HORSES—improving the breed of	135
To improve the breed of horses, it is essential to attend to the properties of the mare as well as to those of the horse	135
Management of breeding mares	136
A particular mode of weaning colts recommended	136
A reason assigned for the superiority of the English breed of horses	136
Marks of a good horse	137
Breaking a horse to the saddle and harness	137
DISEASES OF HORSES—heaves, film over the eyes, cholic	138
Bot worms, false quarter	139
Farcy, foundering of horses	140
Gigs, glanders, hide bound, lampas, poll evil	141
Tumors, scratches	142
Spavin, staggers	143
Sprain, wheezing, wind-gail	144
Yellows	145
HEIFERS—what time they arrive to the age of puberty	150

HAY—the loss it sustains of its nutritive aliments by drying, shown by experiment	153
Hoof ail	155
Horn distemper	155
Hoven, a disease in neat cattle	156
Hoven, or swollen, disease in sheep	168
HARROWS, the best, how constructed	207
How and when used advantageously	207
The double harrow described	208
When profitable to harrow grass land	208
Harrows should be constructed so as to prevent harrowing too deep	209

I

Iron—the acid and oxid of iron explained	31
The oxid of Iron gives to sand and clay the brown and redish color, as well as the intermediate shades	31
Improvement of lands by ploughing and harrowing	51
How the process of ploughing and harrowing should be executed to render it efficacious	52-53
Mr. Quell's opinion respecting the efficacy of ploughing and harrowing in improving land	52
Two experiments in attestation of the utility of ploughing and harrowing cited	51-52
Insects, Canker worms, caterpillars	179
Grubs, to or spindle worms, blackworms	180
Red worms, timber worms	180
Maggots, yellow striped bug, turnip fly	181
Garden flea, lice, weavel, grasshoppers	182
Circulio	183
Palmer worm, the grub, and wire worm	182
Improving our agricultural economy, its object & importance	264

L

Lime—its use and properties as constituents of the soil explained	26
Loam—not an original earth, its constituents explained	25
Lime—its use and properties explained	30
Loam—its constituent properties explained	31
Lime, remarks on as a manure	39
Lice	182
Lime, its effects on strong land, in the culture of wheat	240

M

Magnusia; its use and properties explained	26
Opinions respecting the use and properties of magnesia as a manure explained	30-31

	<i>Page.</i>
Mould—its constituents and properties explained . . .	31
Manures—The experiments of Mr. Hassenfratz respecting the effects of manures in their different conditions whether whole or decomposed	36
Carbon—its nature and operations as a manure explained . .	36
Coarse manure as straw, &c.—remarks on its effects and ap- plication	37
The various ways in which such manure is rendered less ef- ficacious	37
Different earths will manure each other	38
In what ways sand and clay should be applied when intended to be used as manures	38
The efficacy of various substances, useful as manures . .	38
Marl from bog swamps a good manure on upland soils . .	38
The different kinds of marl described	38
To what soils and for what crops marl may be efficaciously applied	39
Ashes—remarks as a manure	39
Gypsum—remarks as a manure	40
An opinion respecting the different efficacy of the dung of different domestic animals	41
Horse dung injured by laying long in a heap	41
The opinion which has heretofore prevailed that wet yards are best for the purposes of preparing barn manure an er- roneous one	41
Various opinions respecting the best mode of applying coarse manure to the soil	41
Mr. Davy's opinion respecting the proper mode of applying it, and his reasons for it	41-42
How coarse materials should be disposed of, and prepared for manure	42
Various substances proper for compost manure described .	43
Coarse manure should not be long 'exposed to drought, and mo's'ure before it is applied	43
Remarks on the diversity of opinion and practice respecting the application of compost manure	44
Remarks on the economy, and the means of providing com- post manure	45
Remarks on the improper manner of applying compost ma- nure	45-46
The method of covering coarse manure practiced by some farmers	46
Remarks on the importance of ploughing in green crops as a manure	47
A mode suggested, by which green crops may be most effec- tually covered by ploughing	47

	<i>Page</i>
Mulberry tree—the effect of its shade on vegetation	230
Mellons—different varieties and cultivation of	244
Metheglin, manufacture of	259
Mead, different kinds described	260
Maple sugar, process of manufacturing	270
Mode of reducing the syrup to sugar so as to make it very white and beautifully grained	276

O

Oats—too much inattention to the culture of this crop generally	78
The culture of oats should be encouraged	78
Remarks on the value of oats for horses	78
Remarks on the different varieties of oats	79
Remarks on the proper quantity of seed oats on an acre	79
Remarks on the soil proper for oats	80
An opinion that oats succeed well after a crop of spring wheat or rye	80
Oats may be sown for the purposees of hay	80
Ox—signs of a good one	149
Overflowing of the gall	157
Ox—disease in the foot of	159
Oak black—the effects of its shade on vegetation	130
Onions—cultivation of	245

P

Plant—the supposed manner in which nourishment is communicated to the plant	35
The agency of water in the growth of plants	36
Plants derive some part of their nourishment from the atmosphere	36
The efficacy of the atmosphere on plants in proportion to that of the soil	35
The science of the manner in which nourishment is communicated to the plant, important to make a proper application of manure	36
Ploughing and harrowing—how it should be executed to improve the soil and prepare it for a crop	54-55
In ploughing, so as best to promote vegetation, there cannot be too perfect pulverization of the soil	56
Potato—remarks on methods to improve the crop of	90
How to obtain new varieties of	90
Diversity of opinion respecting the best seed potatoe	90
Irish method of preparing seed potatoes	91
Remarks on the different methods of cultivating potatoes	91-92
Other modes of acquiring new varieties of potatoes	92
Remarks on the different varieties of potatoes	92-93
Potatoes the best preparatory crop for wheat	93

	<i>Page.</i>
Remarks on digging potatoes	93
Pea—Remarks on the value and cultivation of peas	110
Remarks on the pea bug	110
What time peas should be sown	111
Peas should be ploughed in	111
Mr. Batram's remarks on the pea bug	111
Poison of animals—remedy	159
Perperal fever—disease in cows	160
Purging—disease in sheep	168
Pine plain land—remarks on the nature and condition of	186–187
Fertilizing by clay a vegetable manure	187
Fertilizing by Gypsum	188
Fertilizing by turning in green crops	188
Fertilizing by repeated ploughing	188
Fertilizing by paring and burning	188
A rotation of crops in pine plain land recommended	191
Pine plain land	191
Remarks on the value of the pine plain lands	191
Poultry—general remarks on the advantages of keeping poultry	199
A singular experiment respecting the fattening of poultry	200
The value of charcoal in feeding poultry explained	200
Remarks on the prolific nature of the dunghill fowl	201
Remarks on the guinea fowl and turkey	201
Remarks on the management of geese	202
On the varieties of tame ducks	202
Plough—certain important principles relating to the construction of the plough, to be attended to	209
Plough invented by Thomas Jefferson described	209
Rules for constructing a plough by a Pennsylvania farmer	211
Ploughing—general remarks on the process of ploughing	212
General remarks on the purposes and mode of ploughing	212
On deep ploughing, and turning up red soil	212
Crench ploughing, when proper	213
When cross ploughing should be omitted	213
Remarks on ploughing for winter wheat	213
How low flat land should be ploughed	214
Ploughing in grain instead of harrowing recommended in some instances	214
On ploughing clay soils	214
Remarks on ploughing in ridges	215
On ploughing indian corn lands immediately after the corn is off	215
General maxims respecting the proper depth of ploughing	215–216
Circumstances which render deep ploughing inexpedient	217
Remarks on the particular advantages of deep ploughing	217

	<i>Page.</i>
Plaster of Paris—A reason why it is sometimes not efficacious, by Sir Humphrey Davy - - - - -	227
Remarks on different modes of applying it, by Colonel Taylor - - - - -	227
Its value in mixing with seed wheat - - - - -	228
Plaster of Paris, a valuable ally, but not a substitute for manure - - - - -	228
In the use of the plaster, the nature of the soil as well as the plants to be considered - - - - -	228
How it should be applied when intended to increase a crop of winter grain - - - - -	229
Its use and proper application not sufficiently understood -	229
POPLARS—the effect of its shade on vegetation - - - - -	239
Poplar lombardy, its use and properties - - - - -	125
PEPPER RED—cultivation and preservation of - - - - -	250
PEAK GARDEN—varieties and cultivation of - - - - -	243

R

RYE—no essential difference between winter and spring rye - - - - -	73
Remarks on the advantages of the rye crop - - - - -	73
Remarks on the advantages of feeding rye in some conditions	73
Remarks on the proper quantity of seed for rye - - - - -	73
The proper time for harvesting rye - - - - -	73
Rye—sometimes sown for the purpose of pasture and hay	73
Rye stubble should be ploughed under to destroy weeds and improve the soil - - - - -	74
Remarks on rye flour for bread - - - - -	74
Roots—their value in feeding to neat-cattle - - - - -	154
RED WORMS - - - - -	180
HORSE-RAKE—description of it - - - - -	206
Advantages of a horse rake and how used - - - - -	206

S

Diseases of swine - - - - -	175
Fever or raising of the lites - - - - -	175
STRAW—winter waste of straw by farmers - - - - -	224
Method of saving straw recommended - - - - -	224
Straw as a constituent of compost manure claims a different consideration from other constituents - - - - -	225
The best mode of converting it into manure - - - - -	225
Method of feeding straw recommended - - - - -	226
SHADES—of some particular trees, their effects on vegetation	230
SOIL composed of several simple substances, viz. sand clay, lime magnesia - - - - -	25
Those four simple substances do not constitute a fertile soil in whatever proportions they may be mixed - - - - -	26

	Page.
Proved by the experiments of Giobert and Lampodius -	26
The constituent substances of a fertile soil discovered from analysis -	27
Sand and clay the principal constituent simple substances in most soils -	27
The nature and properties of the different constituent substances of soils explained	26
The obstacles to improvement may be found in the subsoil, as well as the surface	28
The use and properties of sand in promoting vegetation	29
Sand and clay when thoroughly mixed become important agents in promoting vegetation	29
Soil—the blackish color of soils in the territory of a country long cultivated, explained	31
Soils, advantages of analyzing them	31
A process described to analyze the soil	31-32
Soils apparently good sometimes in a great degree	32
The proper proportions of the simple earths to constitute a fertile soil, to be determined by practice and observation	33
SEEDS will not germinate at a certain depth below the surface of the earth	34
The sooner the plant make its appearance after the seed is sown, the more vigorous and healthy will it appear	34
Mr. Davy's remarks respecting the necessity of atmospheric air in the germination of seed	34
Soil, improved by breaking up old grass	47
The reason why breaking up old grass is not often practiced and rendered successful	48
The expediency of breaking up old grass particularly applicable to clayey soils	48
Remarks on the manner in which the process of breaking up old grass ought to be executed to render it efficacious	49
The opinion that the farmer can keep more stock by letting his old grass remain in pasture, rather than convert it to tillage, believed to be erroneous	50
The objections to breaking up old grass considered	51
SOILING—what is understood by it, and its object	58
The probable origin of soiling suggested	59
Remarks on the advantages of soiling	59
Those who cultivate small tracts of land most benefited by soiling	60
ROLLER—The use of the plain and spiky roller explained	61
Soil sickness in neat cattle	155
Scouring symptoms in neat-cattle	156
Staggers in neat cattle	157

	<i>Page.</i>
SHEEP —Original causes of differences among sheep	161
Different soils suited to the different breeds of sheep	161
Remarks on the expediency of keeping the different kinds of sheep	161
Different kinds of sheep in Great Britain described	161
Merino sheep—remarks on the introduction of	162
Our common sheep improved by mixing with	163
Mr. Livingston's remarks on improving the breed of sheep by crossing	163
Rule for selecting ewes	163
On shearing merino sheep	163
Management of sheep after shearing	164
Remarks on managing the wool	164
An European method of managing merinos before carding	164
Dry food for sheep in winter, its effect	165
Succulent food for sheep recommended	165
Superiority of sheep in Great Britain and to what owing	165
Diseases of sheep	165
Bot—scab	166
Ticks—staggers	167
Hoven or swollen—purging—the fly or Maggot	168
Worms in the head of sheep	168
SWINE —Remarks on the economy of keeping	169
The chinese breed, described and recommended	170
Spanish breed described and recommended	170
Rules for improving the breed of swine	170
Remarks on sows eating their offspring	171
Objections to raising hogs for market considered	171
Remarks on feeding swine	171-172
Diseases of swine—Measles—Mange	174
Murrian, or Leprosy, garget, inflammation of the udder	165
Dry caught	175
Sowing, circumstances to be attended, to render it successful	277
Seeds, how provided and preserved	278
Miller's experiments respecting seeds for sowing	278
Proper times for committing seeds to the earth	279
The forwardness of trees in unfolding their leaves the best criterion for the sowing season	279
Proper depths for burying seeds	280
Few seeds will come up if buried deeper than nine inches	280
Some seeds will not rise if buried more than two inches	280
Nature and state of the soil to determine depth of sowing	280
Tull's method to determine the depth in a doubtful case	281
Advantages of sowing with a drill	281
Relative quantity of seed to be sown on rich and poor land	282
Season proper for sowing winter grain	282

T

Page.

TEAMS, a mode to effect deep ploughing with less strength of team suggested	55
TURNIPS, The raising of turnips a great object in the husbandry of Great Britain	86
Remarks on the varieties of turnips	86
Remarks on the methods of raising turnips	86-87
Objections to the raising of turnips considered	87
A method of harvesting a large crop described	87-88
Turnip crops prepare the ground for wheat or grass	88
Antidote to the ravages of the turnip fly, little black flea that infests them	88
The quantity of seed proper for an acre	89
Remarks on sowing the turnip	89
TEAMS—remarks on the relative value of horse and ox teams	131
Ox teams the only ones used for the plough or for burden in many places	132
Mr. Livingston's remarks respecting cattles drawing by the horns	132
A mode of harnessing cattle substituted for bows in Europe, described	132
Mr. Livingston's remarks on the utility of different modes of draft for cattle	133
Advantages of horse cart explained	133
An improvement in the harness suggested	134
Ticks in sheep	168
Timber worms	180
Threshing machines, advantages of	262

V

VEGETABLES, number on our globe which have been discovered	34
--	----

W

WHEAT. The different varieties of wheat in use described	62
General divisions of wheat, divided into two classes, the thick chaffed and the thin chaffed	62
The thick chaffed most exposed to mildew, and gone out of use generally	62
The general divisions of wheat in the United States, are winter and spring, from which other varieties are derived	62
In what soils wheat will flourish	62
Proper time for sowing wheat	62
Quantity of seed to be sown per acre	62

	<i>Page.</i>
Wheat cannot be raised successfully without proper attention is paid to preparing the seed	63
Antidote against frosts' injuring wheat	63
Manner in which frost injures wheat	63
When spring wheat should be sown	63
Effect produced from bringing wheat for seed from the north into the United States	63
Different methods of preparing the soil for a crop of wheat	64-65
A summer crop should precede wheat, instead of summer fallow	66
HESSIAN FLY, a remedy described for	67
Smut, how prevented in wheat	68
Harvesting smutty wheat	69
Mildew, remarks on the cause of it	69
Mildewed wheat, when to be harvested	69
Evidence of mildewed wheat	69
Proper time for harvesting wheat	69
Diseases of wheat, generally	70-71
WOODLAND. Policy of France in the economy of preserving wood	123
An opinion that the economy of France in preserving wood is such, that their supplies will never diminish	123
Erroneous management of the American people relating to their woodland	124
Artificial forests recommended to small land owners	124
The locust, and Lombardy poplar	125
Further remarks on the bad economy of American farmers in relation to woodland	125
Unnecessary waste of fuel in boiling water noticed	125
Weavle	182
WEEDS, the injurious effects of weeds on the growth of plants described	219
Weeds may be divided into two classes	219
Necessary means to prevent their prevalence and existence	219
Other means described	221
Remarks on the Canada thistle and some means recommen- ded to prevent it	222
To prevent weeds, was an object of introducing the drill husbandry	223
WHEAT, a successful method of cultivating wheat and po- toes, alternatively	232