PUBLIC DOCUMENTS OF MAINE:

BEING THE

ANNUAL REPORTS

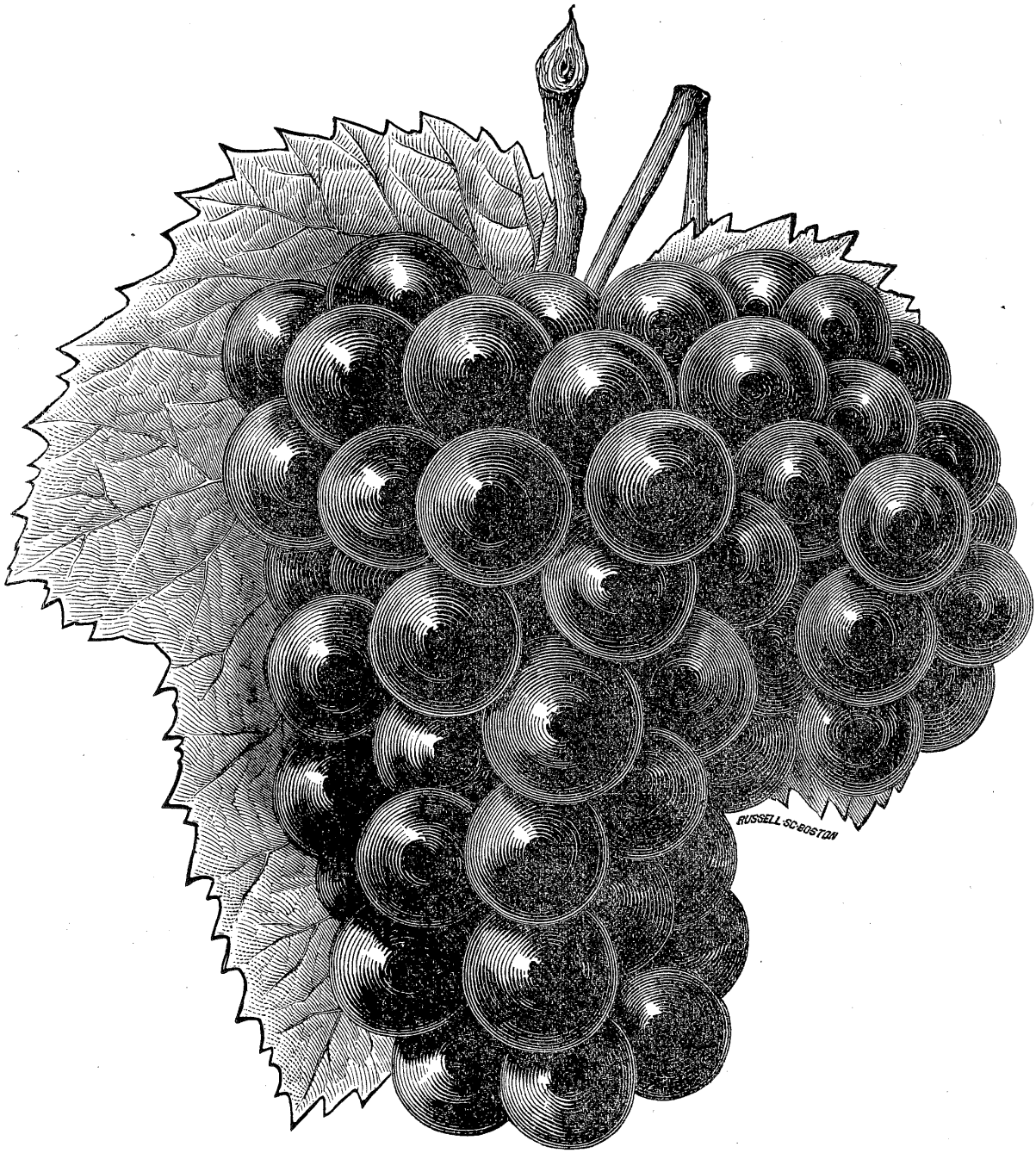
OF VARIOUS

PUBLIC OFFICERS AND INSTITUTIONS

FOR THE YEAR

1867-8.

AUGUSTA:
OWEN & NASH, PRINTERS TO THE STATE.
1868.



THE "SALEM" GRAPE.

A new hybrid Grape, originated by E. S. Rogers, Salem, Mass. (See page 246.)

TWELFTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

MAINE BOARD OF AGRICULTURE.

1867.

AUGUSTA:
STEVENS & SAYWARD, PRINTERS TO THE STATE.
1867.

BOARD OF AGRICULTURE.

SAMUEL WASSON, PRESIDENT.
ASA SMITH, VICE PRESIDENT.
S. L. GOODALE, SECRETARY.

(TERM EXPIRES JANUARY, 1868.)

NAME.	COUNTY.	P. O. ADDRESS.
ASA SMITH,	Penobscot,	Mattawamkeag.
SAMUEL WASSON,	Hancock,	Ellsworth.
E. R. FRENCH,	Franklin,	Chesterville.
J. W. HAINES,	Aroostook,	Maple Grove.
P. M. JEFFERDS,	Piscataquis,	Foxcroft.

(TERM EXPIRES JANUARY, 1869.)

PETER W. AYER,	Waldo,	Freedom.
E. WILDER FARLEY,	Lincoln,	Newcastle.
RUFUS PRINCE,	Androscoggin,	Turner.
C. CHAMBERLAIN,	State Society,	Foxcroft.
JAMES M. CARPENTER,	Kennebec,	Pittston.

(TERM EXPIRES JANUARY, 1870.)

JOHN W. DANA,	Cumberland,	Portland.
S. F. DIKE,	Sagadahoc,	Bath.
SAMUEL HOLMES,	Oxford,	Peru.
ALBERT MOORE,	Somerset,	North Anson.
S. L. GOODALE,	York,	Saco.

REPORT.

To the Senate and House of Representatives:

In accordance with the provisions of law, the Board of Agriculture convened at the State House in Augusta, January 16, 1867, and was called to order by the Secretary.

Hon. Asa Smith of Penobscot, was called to the Chair, for purposes of organization.

Messrs. Wasson, Carpenter and Prince, were appointed a Committee on Credentials. They reported a quorum present. Permanent organization was effected by the unanimous election of

SAMUEL WASSON, *President.*
ASA SMITH, *Vice President.*
STEPHEN L. GOODALE, *Secretary.*

Messrs. Goodale, Chamberlain and Dana were constituted the Business Committee to report subjects for investigation and discussion.

Messrs. Dana, French and Moore were appointed a Committee on tariff on wool, and to confer with an expected convention of wool-growers on the following Wednesday.

The rules of order in use at last session were adopted for the government of the Board during the present session.

Pending the report of the Business Committee, several papers prepared during the interim, were presented, read and discussed, as follows:*

Apple Orchards.—By Calvin Chamberlain.

The subject that we have selected to present briefly to the Board, is one that has been a standard theme in this country since the youthful days of Washington, and in this State an interesting

* It may not be out of place here to give one of the standing rules of the Board. "It is understood that the Board does not endorse the peculiar views, theories or assertions advanced in the reports of Committees and papers prepared by individuals, but it does become responsible for the correctness of the principles and recommendations contained in the resolves which may be appended to such reports and papers."

one certainly, since the first lessons dropped from the pen of our teacher, the late lamented Dr. Holmes. Our agricultural reports, in the labors of the Secretary of this Board, and others, have not been remiss to this interest. Our standard agricultural paper, the Maine Farmer, has labored from year to year by intelligent writers through its columns, in the same direction. We have had our State Pomological Society—once surely a living entity. Perhaps enough has been done and said, written and printed on this subject in this generation. If so, the proof would seem to be in an abundance of trees, yielding an annual supply of good apples, equal to the healthful demands of our home population and for export. But what are the facts presented?

New England soil once sustained the apple tree to a vigorous old age, with little care, and the crop of apples in some localities was at times prodigious. This great providential blessing, almost equal to tropical productions, was to some extent abused and turned into the channel of man's vices. When the light of progress revealed a nation's sensual degradation, a few, more zealous than wise, cut down good orchards, as the shortest means to dry up a tributary to the fearful river of inebriation.

Relying too much on the endurance of existing orchards, and taking no note of climatic changes induced by the removal of the forest, orchardists have suffered this interest to waste away under their hands to an alarming degree. A few saw the error in time, and faithfully gave warning. These warning notes took effect in a degree; but the hard winter of ten years ago, by laying waste the labors of many, discouraged general effort; and production has since rapidly declined. When apples were plenty and trees easily grown, we were advised to raise sweet apples for our farm-stock. When they were so abundant that good ones were valued at no more than five or six cents per bushel in the orchard, people studied how to consume them advantageously by all domestic animals. Such extreme production of a valuable fruit many of us have witnessed; but it is a condition of things that may never again return to us. May we hope to see our people rally to restore this interest to a normal condition, in which apples may command compensating prices, and be obtainable by all? The signs are abroad that lead us to this hope. The consideration of the first steps to be taken in this matter, is the chief object of this article.

That our climate has considerably changed since the first orchards were planted in the narrow "clearings" of the forest, is

generally understood and considered. Also that the soils of the older farms differ from their original elementary condition. Destructive insects have enormously multiplied. With some conception of all these negative conditions to success, we have noticed a constantly increasing inquiry for nursery stock.

Nurseries of apple trees are believed to have declined as rapidly as orchards. In some of our counties but very few or none exist. Men who have the taste and skill to produce nurseries, have met so many discouragements in the business, that most of them have retired on some safer pursuit. If we wait for the revival of nurseries by the hands of the few, we shall lose much valuable time. When good trees are scarce, errors are committed in setting worthless ones. A real case of setting bad trees may best illustrate this point.

Some years since, the writer had a neighbor who came in possession of a valuable lot, on which he resolved to raise an orchard in the shortest possible time. There were then good nursery trees within a mile of his lot. His idea of making haste led him a dozen miles away, where a farmer had a cluster of seedling trees that had been growing thirty years or more. A cart load of these were bought at twenty-five dollars per hundred, and pulled, transported, and set in the usual manner. He then invited us to change the heads of his well-grown (?) trees to the desired varieties of fruit. We found many of them two inches or more in diameter, and eighteen feet high. Our first remark was, that we would rather start an orchard with so many apple seeds, and that we could gain in time by the choice. His trees soon disappeared, and the lot is now a hay-field, as it was before.

The time *was* when the careful farmer had his little patch of nursery, from which he annually drew the trees for the extension of his orchards. Many of those—our fathers—well understood that seeds taken from choice apples were much more likely to produce good fruit, than seeds from the pomace of the cider mill. In our boyhood days we were taught to save the seeds from the grafted apples that we relished so well. These seeds were put in wet dirt and frozen, and planted in early spring. This little act of painstaking paid well. Many orchards have been thus produced where a poor apple could rarely be found.

Farmers should return to the practice of raising their apple trees. They are worth much more when grown on the farm than at a distance. They may be taken up, a few at a time, at odd

hours in spring or fall, and set in the orchard without long exposure to drying winds. Our present advice, if not of much worth, has the merit of being in season. Any family may, before the frosts of the present winter are past, obtain seeds from good apples enough to plant thickly in the garden in spring one row a rod long. When grown one or two years, these seedling trees should be transplanted to one foot distant, in rows three feet apart. One square rod will thus contain trees to set an acre of orchard. The transplanting is best done by taking up in autumn and packing the roots in earth in the cellar. They may be grafted at any time during the winter, and re-set in spring. Or they may be re-set when pulled, in fall or spring, and budded or grafted the following year. Or they may be allowed to go to the orchard as seedlings, and such only subsequently grafted in the branches as produce undesirable fruit. No farmer should be discouraged from entering on the advice here given by reason of our using the words *budding* and *grafting*—expressing simple operations that he may never have performed. We show that a good orchard may be grown without their aid; but any farmer—man or boy—may bud or graft all his fruit trees. The cuts in any fruit book are a sufficient guide; or send the boys in groups to some practical person, and learn both by *seeing* and *doing* it. We will engage to put a class of fifty through a practical course on a pleasant May day, for the compensation of a postage stamp a head.

Let no man attempt to raise an orchard till he is ready to give his trees that care he knows to be requisite to produce a crop of corn or potatoes. The apple tree now must have care in all its stages, from the planted seed to the mature tree yielding its ten barrels of fruit.

Now that we see and feel the necessity for renewed effort to restore the sad decline in our orchard products, the inquiry arises: "What of our varied soils will, and what will not sustain orchards?" The soil of our State is considered as "drift"—not being formed from the decay or disintegration of the underlying rock. Its character is not judged from the nature of that rock, which is rarely seen to modify the superincumbent soil to any considerable degree. In the immediate valleys of some of our rivers, orchards have suffered more from hard winters than those located on the hills. Whether this effect proceeds mostly from the greater extremes of temperature in such localities, or from the soil, is left in obscurity. We find occasionally a man succeeding in growing

apples in what appears to be the most unfavorable localities. With such facts before us, we are at present forced to conclude that there is but little land in the present settled portion of the State that is not susceptible of growing apples. Reference here to successful results in culture may be more appropriate than extended theory, in the brief space allotted to this article, beside being more to our taste.

A few years ago, during an hour's ride in a stage-coach in the neighborhood of this Capitol, the decayed aspect of the orchards along the way led the conversation of the passengers to the subject of fruit culture. We were then interested and instructed by the practical remarks of a gentleman who resided in one of the eastern counties. Last August, being in the neighborhood of the gentleman, (and we regret that we are at present only allowed to speak of him as Mr. A,) and retaining in our mind's eye the picture of his village garden with its fine apples and pears, we called on him, and our suprise may be imagined on being led into a lot of seven acres, covered with an orchard of apple and pear trees, well grown, and bending under enormous loads of fruit. Mr. A. has worked hard at a profession for many years ; but being the son of a farmer, his early taste and habits have led him extensively into farming—his "garden" of seven acres being but a small part of the area covered by his operations. He informed us that every tree here seen had been planted and grafted by his own hands. Our visit being necessarily brief, we have since obtained through a private letter from Mr. A. some facts additional to those communicated verbally at the time of our visit. It affords us much pleasure to be permitted to quote from that letter as follows :

" Your note, making certain inquiries in relation to my cultivation of the apple tree, is at hand. I regret that the multiplicity of other engagements precludes the possibility of replying at length. The little success I have met with in that department of agriculture, which you have so kindly noticed, is attributable to constant thought and observation. I have derived little or no benefit from books upon orcharding, though I have carefully read them all. They are written upon the cultivation of trees in the soil that nature designed for their growth. My soil was naturally the meanest in the State, and there are few men who would have attempted to plant apple trees upon it. No author who regarded his reputation has been bold enough to consider the cultivation of such land for such a purpose. My experiments for the last twenty

years has been of that character which forces nature to a reluctant discharge of certain duties. The rock here is schistose, but hard; the soil very thin, a coarse, cold, loamy gravel lying on a tight pan inclined to clay, and full of stones—say about one hundred cords to the acre. The growth originally was small hemlock, tamerac, cedar, spruce, some pine, and occasionally a white maple with a hollow butt. I drew the stumps from the larger part of my field green in 1854, and took out the stones and prepared it within a year or two afterwards for trees. I underdrained some six or seven acres, four and a half feet deep. The drains are not parallel, but cut where required. I think I have about two hundred and fifty rods of this drain in the field. These drains are made about four or six inches square at the bottom, filled with stones to within twelve or fifteen inches of the surface, and gravelled, and then filled with earth.

I tried three experiments in planting the trees. No. 1—holes were dug eight feet in diameter and twenty inches deep, and filled with alluvial soil from a low island in the river. I planted one hundred trees, twenty feet apart in these holes, in the top soil. No. 2—I plowed the land in ridges twenty feet wide, the dead furrow coming where the rows were to stand. I passed across these lands with an ox scraper eight feet long, dropping it in each dead furrow, and returning in the same line, drawing the other side out. I again plowed through these cavities and scraped a second time. I put into these holes a full ox-cart load of black ash swamp mud, and about one bushel of slaked lime well mixed. Some rich top soil was thrown into this deposit, and one hundred trees planted in that soil. The field was then plowed level. No. 3—I took an acre that had been cultivated with potatoes, corn, &c. I spread upon it one hundred ox-cart loads of muck and lime, and I think about thirty loads of manure. I took a road plow and eight heavy oxen, holding the plow myself, with a heavy man constantly upon the beam. I drove it through the land twenty inches deep. The following spring, having removed all the stones, I spread on some more manure—I have forgotten the quantity—plowed the land again about six inches deep, and planted one hundred trees *upon* the land, not *in* it—that is, the holes were not more than three or four inches deep. I have since dressed all this land with mud (muck) at the rate of three fourths of a cord to each twenty feet square—not all at one time—and have kept the soil under cultivation. My other trees have been planted in the ordinary method.

I think the best trees are on field No. 3, on the deep plowing. Most of these trees have been planted since 1857—many of them since the spring of 1860. I gathered this season one hundred and fifty barrels by hand, and had something over one hundred bushels of cider apples. I took this season from the same land a large quantity of small crops—fifty bushels of barley and about eight hundred bushels of potatoes. If you will call upon me a few years hence, I will show you a crop of one thousand barrels. I have tried some one hundred varieties of the apple, and thrown away about fifty recommended in the books, as worthless in this soil and climate. Among them is the Baldwin. I cut down a tree of that variety this fall, that had been living and dying for ten years, and produced about a barrel of imperfect apples.

I have arrived at certain conclusions, viz: that some varieties of the apple will grow and do well where others will not; that the same variety of scions will not grow in all trees; that a tree may be planted upon *any soil*, even a stiff, blue clay, and made to grow and do well; that all soils retaining or holding water, must be underdrained, and if clay, the drains must be under the trees. That a tree must be fed with those elements constituting its substance, and that such is contained largely in the muck upon which hard wood is growing, mixed with ashes; lastly, that the great enemy of an orchard is *grass*, that it must not be permitted to grow in the same field where the tree stands, and the orchard should in this region be kept in constant cultivation. These observations do not apply to trees standing on rock-maple land. You and I know what that is. I dare not go further—the field is too broad. I have discovered one or two principles, perhaps, in Dendrology, that underlie the vital force of an apple tree, but am no essayist upon their cultivation."

The facts narrated in this letter are to us exceedingly instructive, from the boldness of conception in the several experiments, and the thoroughness of their execution. But the great value of the experience of Mr. A. consists in the fact that four hundred of his excellent apple and pear trees stand outside of his three experiments in planting. He says these others "have been planted in the ordinary method." The scarcity of fruit in the region round about this fine orchard attests the statement, that "the soil was naturally the meanest in the State." Here is proof that a cold—wet, retentive soil, may be successfully fitted for an orchard by good drainage under the trees; deep plowing, constant cultiva-

tion, barn manure, muck and lime as amendments, doing the rest.

Fortunately, there are but few homes in the State located on lands of so forbidding a character as in the case above. Yet many orchards have gone to early decay by reason of excessive wetness in the soil on which they were planted. These cases occur as often on the most elevated sites as in the valleys.

In leaving the subject, we will add a few words on the *form* of an apple tree. The practice has been to train them with a trunk of six or eight feet. There are conveniences in this method. The cultivation can be performed more entirely with a team. It is very convenient to shoulder a basket of apples under the tree, with a freedom to carry it in any direction through the orchard. This form may still do very well in locations sheltered from prevailing winds. But as the country has become more open and bleak, the stem of the tree should be shortened. We would rather see it only one foot long, than five or seven. To allow for this form, the trees should not be set nearer than twenty-five feet. Thirty-three or forty would be better.

When trees become larger, and the hand labor in their cultivation too troublesome, a plat of grass may be allowed to occupy the space immediately around the tree, and all the space open to the movement of a team continued in cultivation. The grass plat may be top-dressed or mulched; but the fertilizers applied in the cultivable area would be just where to most benefit the trees.

It would add to the value of orchards, (as well as to the value and beauty of homesteads, and to the country at large) to plant screens on their northerly side, half encircling them. For such a purpose, a mixture of evergreen and deciduous trees would be best; selecting those most valuable for timber, such as the pine, hickory and oak.

We would advise the planting of the Siberian Yellow Crab, as a nursery stock for localities where orchards have not succeeded. This is an extremely hardy tree, takes a firm hold of the soil with vastly more root than the common apple. It is a rapid grower when young. If it does not attain to so great size, we think no harm will come from using it as a standard to graft upon in the orchard."

Mr. Dike remarked that he had been greatly interested in the reading of the report. He believed there was no difficulty in raising fruit anywhere in the State of Maine, and that our apples are

superior to those of any other State in New England. It was very important to keep out the grass, and to thoroughly manure the soil. He had apple trees upon a cold, wet soil, and had been unsuccessful with them until he underdrained the soil, and gave the ground thorough cultivation. Black-heart cherries, upon the above soil, had borne abundantly the past season, and he attributed it largely to a heavy top-dressing with compost manure. He alluded to the importance of cultivating the land on which trees were growing, and deemed it as necessary to cultivate an orchard as a corn field.

Mr. Dana believed the subject of the report had not received the attention its importance deserved. Fruit of all kinds now finds a more ready sale than it did years ago, and at high prices. He had had experience in planting and raising apples, both in Wisconsin and in this State, and would give a few suggestions from what he had learned. First, if we begin with the seed, we begin away from home, except in one particular; where a tree is grown from the seed in the soil where it is intended to grow, it is usually of a more hardy growth. This is the case with the grape, and perhaps it holds the same with apples. He would recommend buying trees of some reliable nurseryman, thereby sustaining honest men, rather than growing them ourselves. He believed that properly and honestly grown nursery trees would generally succeed better than seedling or native trees, and he regarded a northerly exposure the most favorable for apple trees. Would not transplant a tree if over four feet high, and would put them out in the spring. The proper place to plant a tree is on the surface of the ground, not in a hole. A tree cannot live in a cold, wet soil, without underdraining. The rootlets make a poor growth if confined in a hole, but if covered with the material nature provides, succeeds admirably. He believed the soil of an orchard should be kept open the same as with any other crop, and no crop should be allowed near the trees, or within reach of the roots. Rapidly grown wood contains a superabundance of sap, and hence the tree is injured by the frost. He regarded the super-phosphate of the Cumberland Bone Company the best manure for apple trees he had ever used, as it produces good hard wood, but he would not have it put in immediate contact with the roots of the tree. Dwarf apples will produce in two years from the time of planting, and a Red Astrachan apple, on a tree not higher than his head, bore much better than some much larger trees. In this climate our orchards *must*

be protected from the winds. He would recommend belts of trees on the windward side of the orchard for this purpose; if not possible to windward, then to leeward. If these cannot be secured, a slat fence will answer the purpose, having the boards about one inch apart. The subject of injurious insects is of great importance, and he thought it should receive the earnest attention of the members of the Board. In order to stop the increase of the apple worm, he had taken about a quart of coal tar, incorporated it evenly with about a bushel of sand, and sowed it under the trees at the time when the fly is depositing the eggs. It is offensive to the insects, and it is not injurious to the tree. He placed a very high value upon it, and could recommend it to others.

Mr. Carpenter thought the tree should be put in where it is to grow, *early*, and then grafted. This he believed was the proper way to get an orchard. Farmers should also make it a duty to grow seedlings upon their own farms,—if they have only room for one, put it in, if for a hundred, put them in; by the roadside, where they will push their roots under the wall, and draw sustenance from neglected sources. He endorsed, most emphatically, the matter of protection, and mentioned an instance where a hill offered a good protection to an orchard. Our people should get rid of the idea that they shall not live to reap the benefit of their trees if they plant them. They must, it is true, wage a war against the insects that prey upon our orchards in such myriads, but if we can overcome them, the trees will pay a good return. As to the profitableness of the apple crop, there is no question.

Mr. Haines gave some of his experience in rearing an orchard in Hallowell. It was set out on new land about thirty-five years ago, and this year the orchard produced about two hundred barrels of marketable fruit. Twenty-five years ago, he carried trees from Hallowell to Aroostook and set them out, but they did not succeed. In later years, however, hardy seedling trees succeed pretty well in Aroostook county. Forty years ago, no apples or plums were grown in Bangor; it was the almost universal experience that they could not be raised in that soil and climate; now, they are grown there to great perfection; he would like an explanation of this fact.

Mr. Goodale remarked that it was sometimes more difficult to verify a statement by satisfactory evidence than to accept what currently passes for fact. He said, "I know it was formerly believed generally that fruit would not succeed in Penobscot county,

but it was an erroneous belief. About sixty years ago my father and his oldest brother removed from Worcester county, Massachusetts, taking up and clearing new lands about six or seven miles from Bangor, in what was then called Buckstown, and now known as Orrington. They were told that apple trees had been planted by many thereabouts, and that all failed from some cause or other. Some were killed by the winter, bark-lice ruined others; field mice gnawed the bark off, or the snows broke them down, and in various ways all were destroyed. But not inclined to give up a favorite pursuit upon hearsay evidence, and that wholly of a negative character—that others had *not* succeeded, they began, and they began at the bottom; by sowing seeds—when a year old these were set in nursery rows, and of these some were grafted a little later; some were planted in the orchard to be grafted in the limbs when of larger size. They obtained scions of the hardiest and best sorts then to be had, and although some hindrances were encountered, their success on the whole for the twenty years following, with both the pear and the apple, was greater than has attended the labors of their successors in the same neighborhood during the twenty years last past. It was such as to greatly promote the planting of orchards throughout the county.

Failure of health compelled my father to leave before I was born, but I have since often looked with interest upon the trees of his planting, which added nothing to the price for which he sold the place, but have since proved its most profitable feature. My uncle remained, and was deeply and actively engaged in growing fruit and fruit trees during many years subsequently. No small part of the fruit trees of that section, and of their successful culture, can be directly traced to his labors and example.

Now I venture the opinion that if a similar course be pursued in Aroostook county, similar results will follow. But the farther north we go, the fewer will be the kinds which will succeed. If we only plant Baldwins, the failure will be total. If we depend on such an assortment of kinds as would suit the southern part of the State, a small portion only will succeed. But if the selection be confined to such as have proved *hardy enough*, (like the Duchess of Oldenburg and a few others,) there may be fully satisfactory success."

In reply to a question of the cause of the general failure of "New York trees," Mr. Goodale said it was not so much because they were grown in New York, as because they were not properly

grown—they were got up to sell cheap, by the process of grafting on bits of root. These bits of root kept the plant alive till it threw out roots of its own, when it became substantially a rooted cutting, and wholly lacked the vigor and strength of constitution which is possessed by a tree grafted upon an entire seedling root. Besides this, most of the New York trees sent into the State are of kinds which are not adapted to the climate, and could not be expected to succeed well even if the trees were properly grown.

Mr. Prince spoke of the benefits of underdraining as proved by his own experience. In a part of his orchard not drained, the trees set at the same time with those set on drained land were small and unhealthy, while the others were larger, more vigorous, and bore much better. The drains were three feet deep, filled with stones and covered. He cultivated his ground the first four years after the trees were set, then seeded it down, and has since kept it in grass, and mulched his trees as far as the the roots extend.

Mr. Ayer said that his was a hard tenacious soil, over a hard clay pan. In setting his trees, he dug holes for the trees, filling the hole nearly to the surface with small rocks, then putting in loam and compost, and after that the trees were set. They had succeeded well, and he believed it a cheap way of drainage.

Mr. Farley said he thought the plan would have been better if the gentleman had made a regular drain, putting in the stone, covering them, and then planting the trees in a row within a reasonable distance from the drain. This would be the plan he should follow. He gave an account of his own orchard, and was satisfied that even in the oldest sections of our State apples could be grown successfully. For lice, he had applied thick soap-suds to the trees, putting it on in April or May. It gives the trunk of the tree a fine glossy appearance, and is a safe, easy, and sure remedy for the lice.

Mr. Chamberlain had experimented with coal tar for the purpose of keeping the curculio from his plum trees, bringing the flavor of the tar in contact with the insect, and had succeeded very well. He thought perhaps the plan suggested by Mr. Dana was a better mode of using it.

Mr. French spoke of renovating old orchards, and of the value of mulching as an auxiliary in performing it. Brakes from the pasture were used by some for this purpose to good advantage.

The report was adopted and placed at the disposal of the Secretary.

The next paper presented was on

Raising Horses.—By P. M. Jefferds.

Among the topics presented by the Business Committee of last session for consideration during the interim, was that of raising horses. I am aware that much has been written upon this subject, and do not expect to offer much that is new or original, but having been engaged in raising colts for a few years, and giving the subject some thought, I propose in this paper to give the result of my observation and experience, rather than attempt to form a perfect theory, or lay down arbitrary rules for the regulation and observance of others.

That our horses are not what they should be, and what they might be, if the true principles of breeding were well understood and properly attended to, is evident from the large number of ordinary animals compared with the really fine ones. There is no doubt but they might be bred to the standard of the best. Among wild horses we find them assuming one type in each locality; this is because the laws of nature are not interfered with. So in the domestic state we might breed them to one type, if the proper laws were observed. The first question to be considered is this: What kind of an animal do we want?

To answer this we must find what kind the market demands, the cost of raising the different classes and those best adapted to our soil and climate. A horse for light and quick work is now generally wanted since railroads have become so common in New England. A good driving horse weighing from nine to ten hundred, brings as much as a work horse that will weigh twelve or fourteen hundred, and sells much quicker. The light horse is fit for market one or two years younger, and is better adapted to our soil and climate, being more hardy and less liable to accidents in our rough and rocky pastures. The horse is an animal that adapts himself to his situation; in proof of this we find the Shetland Pony on those bleak islands a mere pigmy besides his brother the Clydesdale of the sheltered vale. Not that we should breed ponies or undersized horses because our climate is rigorous, but rather should we be careful that they do not deteriorate in that direction. As roadsters and trotters are more generally useful we will take this class as our standard.

I am aware that it is common and quite popular to cry out against breeding for speed, and say we are ruining our horses by

so doing; but does any one believe the horse "General Knox" would be any the less valuable for a farmer's horse, a grocer's wagon, or a butcher's cart, on account of his speed, or that "McClellan" would not make a good livery or gentleman's driving horse, because he can trot a mile in less than two minutes and forty seconds? Neither was "Flora Temple" the less valuable for a let horse before her speed was known. Speed is the test of power and almost the least valuable of all, for the horse that can carry a load ten miles while another is going five, or do a journey of sixty miles in a day, with the same ease that another does thirty, is worth twice as much, independent of fancy or amusement.

A celebrated writer says, speaking of the thorough-bred, "That which the blood-horse does possess is a degree of strength in his bones, sinews, and frame at large, utterly out of proportion to the size or apparent strength of that frame. The texture, the form, and the symmetry of the bones—all in the same bulk and volume—possess double or nearly four-fold the elements of resistance and endurance in the blood-horse, that they do in the cold blooded cart horse. The difference in the form and texture of the sinews and muscles, and in the inferior tendency to form flabby, useless flesh, is still more in favor of the blood-horse. Beyond this the internal anatomical construction of his respiratory organs, of his arterial and venous system, of his nervous system, in a word, of his constitution generally—is calculated to give him what he possesses—greater vital power, greater recuperatory power, greater physical power in proportion to his bulk and weight than any other animal." This animal has been produced and perpetuated by breeding for speed and endurance. He is the size of the English Hunter and gentleman's hack, from mares of other breeds and more bulk, and from him they derive their power of endurance and general usefulness for all work, with increased size from the dam. Here we would say, the horses that have performed the wonderful feat of trotting twenty miles in less than one hour were descendants of this breed of horses. Bright's "Trustee," by imported "Trustee" from a part breed Messenger mare and "Captain McGowan" raised in Kentucky; imported "Messenger" and "Trustee" were the founders of some of our best families of trotting horses.

The Winthrop Messenger, a grandson of imported Messenger, did much to improve the horses of this State. From his size (which he must have inherited from some cold blooded breed which appears occasionally in some of his descendants) the opinion has

prevailed here that the Messengers were a large breed of horses, but such is not the case.

Imported Messenger was a compact, medium sized horse; his grand-sire, Sampson, was one of the most powerful horses which ever appeared on the English turf, though not a pure thoroughbred. The Morgans also, claim to have descended from the thoroughbreds by True Briton. The English thoroughbred is not a natural trotter, being bred for a different gait, but when crossed with breeds which have a natural trotting gait, it gives them power and endurance.

In breeding this class we should seek to produce an animal of general usefulness, that is, his color, size and disposition should be such, that he will find a ready market that will pay the expense of raising, while one that really excels will pay a profit; at the same time the breeder should have a special purpose in view, and proceed upon the principle that "like begets like." If the object is to produce a large horse for heavy work, let him breed from animals of that class, and not attempt to get a large colt from an animal that happened to be overgrown, or by using a large horse to a small mare, or the reverse; in either case, he will be sure to meet with disappointment. The chance animal will be sure to breed to the size of his progenitors, while the unnatural coupling of large and small animals violates the laws of mutual adaptation. Herbert says on the selection, "Nothing is more fatal as a mistake, than to produce great size, or even increased size by stinting undersized mares to great, overgrown, bulky stallions, the result is almost invariably ill-shaped, narrow-chested, leggy animals, with light, round bones and often altogether deficient in balance and counterpoise of parts, having heavy heads, long, weak, unmuscular necks, and either the fore quarters or hind quarters vastly and disapportionally in excess." I have in mind just such animals, the result of such breeding; animals with the body of the sire and limbs of the dam; others with the limbs of the sire and the body of the dam, being entirely out of proportion.

This is not always the case, for sometimes when one or the other is of much purer blood the offspring takes the character of but one. The main object or special purpose for which the breeder is aiming should be kept in view, and if increased size is desired let it be done by degrees, not by violent crosses; if the mare is low let him use a stallion a trifle higher, not a tall, leggy one. Some small but roomy mares will bear to be bred to larger stallions, but as a

general rule the mare should be largest, so as to fully develop the foal. It is considered to be a fully established principle that the female should be relatively larger than the male. This is a maxim laid down by the best authorities on breeding. A writer says, "When the male is much larger than the female, the offspring is of an imperfect form. When the female is disproportionately small, the quantity of nourishment she affords is insufficient for her offspring both before and after its birth—this being an inherent defect, it remains weak through life.

If these principles are true, it follows that crossing large males with small females will produce small lungs, feeble constitutions, imperfect form, large bones with the heaviest end down, weak joints, and nothing valuable. By judicious selection of parents, liberal feeding and careful using of the mare while in foal, and proper care of the colt, the size may be increased without imparing the symmetry or constitution.

The selection of a stallion is of much importance. There should be mutual adaptation to the particular mare. He should be perfectly sound and free from vicious habits. His ancestors should be of a stock that have excelled in the class the breeder is seeking to produce. It is well known that the good or bad points of the progenitors of the sire or dam are as likely to appear again in the offspring, as those of the immediate parent in whom they are dormant; so they are as likely to get stock like some ancestor as themselves. Hence the rule in breeding, that like produces like or the likeness of some ancestor. As a general thing this rule is but little heeded, especially on the side of the dam, while every one will acknowledge it to be correct. If the pedigree is good on the side of the sire, nothing more is asked. My experience has been that the dam of the stallion exerts more influence on his offspring than his sire. This is contrary to the generally received opinion and the golden rule of "blood from the sire, beauty from the dam." I have known as many fine horses from the best of sires, who have been very indifferent stock getters, simply because they inherited bad blood from their dams.

I will take two well known horses to illustrate the influence of the dam on the stock of the stallion. The old Drew horse was from a trotting mare of high breeding, part thorough-bred (Messenger) by a colt said to be of Morgan descent that was sold and no one knew what became of him. He inherited from his dam the qualities which made him eminent as a stock getter. I think I am

safe in saying that no horse in New England has been the sire of so many fine trotters and roadsters, with the same class of mares, for be it remembered that his services were always at a comparatively low rate, and most of his colts were from ordinary mares. His stock have the characteristics of the thorough-bred in their clean heads and limbs and light manes and tails.

The stock of General Knox resembles the Hambletonians more than the Black Hawks, his dam and grand-dam being Hambletonian. I know nothing of her but predict that his stock will be successful or not, as his dam was well bred or otherwise.

Farmers are often imposed upon by horse dealers and men who travel about the country with stallions. They procure some cheap animal, hire a man who can talk horse, and don't care what he says, or go themselves according as they have any conscience or reputation, give some high sounding name and trump up a pedigree; they tell the farmer of his wonderful performances, and offer his services at a very low rate. The horse is fat and well groomed, and thinking he can't do better, it is convenient and will save his going five or ten miles, and paying five or ten dollars more, he don't know but this horse is as good as the other, so he allows his mare to be served. Perhaps he has saved ten dollars by so doing; let us see what the usual result is and how much more he makes than the man who takes his mare to a horse that is known and has a reputation. He wants to sell his colt at weaning time, and is offered twenty dollars for him, while the other sells his for fifty. Or they raise them up to five or six years old; one sells for one hundred and fifty dollars, the other three hundred; one just pays for raising, the other pays a profit of one hundred and fifty dollars. It is bad policy to travel with a good stallion from place to place, standing in three or four different places in a week from five to twenty miles apart. He is apt to have his procreative powers too strongly taxed, besides, the excitement of being in a new place tells on his vital energy. This overtaxing of a stallion's powers is too common a fault. It is better to pay more to sustain good horses than to patronize low priced and hard run stallions.

But the greatest failure in breeding horses is in the lack of good sound brood mares. If the farmer raises a really fine mare he thinks she is too valuable to breed from, so he sells her and breeds from some undersized, broken-winded, ringboned, spavined mare that is good for nothing else, as he says. She is better for anything else than breeding. We shall never improve the general

character of our horses until the best females only are kept for breeding. Lameness arising from accident, of course is not transmissible, and there are many valuable mares that have met with accidents which are properly put to breeding, and from them we have derived some of our most valuable stock. However, a mare may have some defect of the class that is transmissible, and be so perfect in other respects as to make it desirable to breed from her. In this case a stallion should be selected that is perfect and strong in the parts where she fails. The defect may not appear in the immediate offspring which should never be kept for breeding purposes, as the defect will be sure to appear in the future offspring. It is important that the mare should be in good health at the time she is stinted, and during her gestation she should have good wholesome food and moderate exercise, but should never be very fat or heated by overdriving. She may be worked moderately, up to within a short time of foaling, but this requires much care. Many a fine horse is spoiled before he is born. Unless the owner can always use her himself, she had better do nothing after the first three months of her gestation. Still she should have room for exercise. The constant confinement to a close stable is about as bad as overwork. After foaling there is no better management than to let them run at pasture, if the season will permit until the colt is five or six months old. If the mare is wanted for some light farm work, she may be used to no disadvantage if she is not heated. To use them as we frequently see them, the colt tied to the shafts or following along behind, the driver appearing not to know but he has a stable horse, going along at the rate of eight miles an hour, the poor, little barefooted fellow galloping along with all his might and lying down as soon as stopped, is the greatest folly; and the owner should not be surprised if he has a deformed or lame colt.

If taken off sooner than six or seven months he should be fed with cows milk or eat meal gruel for a few weeks to supply the loss of his mother's milk. A little extra care and nursing at this time will do much toward developing the future horse. If he is allowed to lose flesh and stop growing at this time, no amount of feeding or care afterward, will bring him to the condition in which he might have been with a very little trouble at first. As an example, I once weaned two colts at four months old; after shutting them up a few days, they were turned out with a mare and another colt of about the same age. The fall was pleasant and they were

allowed to run out until quite late, by putting them up cold nights and feeding them oats and hay. But they lost flesh, while the one on the mare grew all the time. During the winter the three colts were kept in a pen together. The two did not seem to gain at all, while the one that had run with the mare continued to grow and seemed a year older in maturity ever after. It is best to force the growth of the colt all you can the first winter, and after that if he has to eat some coarse fodder, from the sheep rack or cows stall, it will not hurt him provided he has grain to give him life and muscle, in fact it is better than that he should be allowed to stuff himself with large quantities of good hay.

The opinion generally prevails that colts should not be fed grain, while young and tender, or, if fed to them at all it should be in very limited quantities. This is a mistaken notion; there are hundreds of colts ruined for want of it where there is one by overfeeding grain. Although a colt may look fat and sleek on hay and roots, his flesh is not of the right material, and will never make good horse flesh until it is changed by feeding some other material. The English thorough-bred is expected to eat from six to eight quarts of oats a day before he is one year old, while their oats are nearly double in quality to our own, and their colts are as well matured at two years, as ours are at three and four. They are put to training at this age, and if they have not been fed grain from their birth, they will reject them from their training stables, as they are sure to break down. While we should not go to this extreme, it gives us a hint that is valuable in raising common horses. Grain gives them more animal spirits and causes them to take more exercise which develops their muscles.

A colt should not get fat before he has attained his growth; if he does become so at two or three years old, he is very sure to be deficient in muscles, therefore the colt should have such food as will excite his nerves and give him bone and muscle rather than fat. Another mistake is confining them too closely in winter. How often do we see them confined in a pen just large enough for them to turn around in, there to remain all winter, or, perhaps hitched in a narrow stall and only led out once or twice a day to water, and this is all the exercise they have for seven or eight months. If he was an animal intended for meat this might be rational management, but for an animal whose value consists in his muscular power this seems absurd. The colt is turned out in the spring, tottering on his feeble limbs, and is very liable in his

gambols to sprain some of his tender ligaments so as to make him a cripple for life. If he does not he will not take as much exercise as he otherwise would and becomes fat and lazy, and never make the horse he would if he had proper exercise. The better management is to let them have an open yard, with a warm house or pen to go into in cold weather. If this is not convenient they should be turned loose two or three hours each day where they can run and play. I believe this want of exercise is one of the sources from which we get our lame and feeble horses.

Doctoring, burning lampass, &c., in which some delight is all folly. If a horse is really sick, call a veterinary surgeon if one is near, if not, give him good nursing, and let alone the thousand and one quack nostrums in vogue. I once knew a man to employ a dentist to file off his colt's teeth, to make them even with the new ones when he had shed them. Burning lampass of colts is all nonsense and on a par with cutting the tail and boring the horns of a cow for every imaginary ill. If a colt looks rough and out of condition, it is said his lampass are down, and he is led away to the blacksmith's and the bars of his mouth next his teeth are roasted and seared until they are a hard crisp. You may look in the mouth of another colt that is doing well and will find his lampass down the same as the others. I never had the lampass of but one colt seared and will never have another. The practice is so common that I will quote some authority beside my own experience. Dr. Dodd in his "Modern Horse Doctor" says, "So long as horse owners believe lampass to be a disease and men can be found to burn it out as it is sometimes termed, just so long will the barbarism continue—let it be understood that the bars or ridges of a horse's mouth corresponds to the hard palate in man, which every one knows is not very sensitive, and therefore cannot be the cause of ill health nor prevent the animal from masticating his food. Hence the practice of burning the bars is unnecessary barbarity which should not be countenanced." The writer goes on to quote from other authors showing the absurdity of the practice. Nearly all the medicine a colt requires, is regular salting and a little sulphur sprinkled into the hair about the mane and tail occasionally to keep off vermin.

From these thoughts we draw the following conclusions. The breeder should have a well defined object in view at the start, and select animals to breed from whose ancestors and themselves possess the qualities most desired in the progeny. That to improve

our roadsters and trotters we should select medium and good sized mares, and cross them with medium sized and compact stallions, using no large, overgrown sires thinking to improve the breed. I know of no objection to "in and in" breeding unless the family are deficient in some important particular, then to breed "in and in" would be folly. We should not rely much upon any one point, however excellent, but should take into account, purity of blood, size, form, family or hereditary qualities, both valuable and defective, and unite as many good points as possible. It will cost the farmer who raises a colt occasionally, no more to raise a good one than an ordinary one, while with him who makes it a specialty there is all the difference between a success and a failure. Our horses are bred too much on the haphazard principle without aim or general rule. Let us have thorough-bred trotters and thorough-bred draft horses instead of the mongrels we now produce."

Mr. Goodale thought one expression in the paper capable of amendment. The writer says "speed is the test of power." Now it is not a fact that the most powerful horses are the fastest, and draft is as much a test of power as speed is. Speed depends more upon the *adaptation of the anatomical machinery of the horse to rapid propulsion, coupled with nervous energy,* than upon mere power. A Clydesdale stallion is abundantly endowed with power but no one would select him to win a race or a trotting match.

Mr. Dana said the remarks in the report seemed just, and the conclusions arrived at, in the main, correct, and being derived from the author's own experience are all the more valuable. The topic is one of very great importance. We do not pay sufficient attention to breeding. The laws of generation are as puzzling to veterinarian doctors as the laws of regeneration are to the doctors in divinity. In regard to these laws we are left much in the dark. We grope around in it, and the man who discovers anything to aid us in our difficulty, and acquaints us with his discovery, is a public benefactor. It is supposed that Bakewell and Webb found out some of these laws—but they did not choose to divulge them, and we can only avail ourselves of their knowledge by imitating their known methods. But their attention was directed to the rearing of animals far inferior in value to the subject we are discussing, and they were beset with comparatively few difficulties. We are dealing with an animal of a higher type than that they experimented on. We are seeking to obtain perfection of outward form, internal function, speed, endurance and vital energy or spirit. We

can only reason from analogy, except so far as the cases are analogous. A horse is far more like man than he is to any other animal, indeed he is of all creatures man's best and most valuable friend—patient, affectionate, docible, courageous, spirited, strong, swift and proud. The sacred writers symbolize him, and when the horse and his rider are spoken of, you will observe that he is first named. Accordingly, as man has so many more elements in common with the horse than with any other animal, we can advance our knowledge of these laws of reproduction. I have spoken of both as applicable to him and to us, by studying them in each other's light.

We know that every child born into the world, comes subject to a burden. Prince or peasant, he carries on his shoulders a pack, and that pack is full of his ancestors. Their virtues and vices for some time maintain a struggle for mastery over him, and by the force of these conflicting winds the bark of his life is tossed, until he either yields himself up in despair, or by struggling, reaches that place of security which we term honorable character, formed by himself. Then indeed he first becomes *himself*. During the years of this struggle, he commonly brings to life other existences—and according as this or that ancestor possessed him at the time, he transmits this form or that quality.

The study of facts which may tend to elucidate these laws has always had a kind of charm for me; indeed, I think I inherited it; for my father, though a plain farmer and consequently a man of few books, had some of the physiognomical essays of Lavater, and was an accurate judge of men. These I laid hold of, and I remember that when in college, I was greatly interested in reading the anthropological works of a London doctor by the name of Walker. I looked for them in the State Library to-day. They were not there, but his work on intermarriage should be there for the benefit of farmers if for no other reason, and I was assured by the Librarian that it should be procured. It is so long since I have read his book that I will not undertake to quote him accurately, but I remember enough of his theory to state it in this form at least, that each parent transmits to the progeny a certain set of organs. The male usually gives the external or locomotive organs, and the female the organs of nutrition. This holds good of horses—accordingly fast stallions and thorough-bred mares should be coupled together, for if we would breed for speed, we want a female of a fixed type of excellence, a thorough-bred for instance, united with

a trotting stallion, whether thorough-bred or not. The qualities for speed are transmitted because he reproduces himself externally. He thought accidental injuries and defects were transmitable. It would be a good thing for the Board to consider the subject of breeding large horses for work, to the exclusion of oxen; and also the breeding of mules for work—they are possessed of great endurance, are long lived, and gentle if well used. Speed I do not believe to be the test of anything; it was vital energy that made speed. No horse can go anything but his own gait, it is not in him to go otherwise. One of the best judges of horses of my acquaintance, and a large buyer, when selecting a horse to purchase, invariably goes into a pasture where there are a number of colts, and frightens them. They start off, each at his own gait, and he selects the ones that please him. There was a great difference between trotters and roadsters; a long stride was too exhausting of vital force for a roadster. Colts should not run with their dams after they were four months old, as it was a great drain upon the energy and constitution of the dam. He could not agree with all the conclusions in the report of Mr. Jefferds, but thought is quickened by its reading, and we are put upon inquiry, and inquiry alone can lead to the discovery of truth.

Mr. Carpenter said that the young of all kinds of stock are liable to grow poor at the time of weaning, if great care is not taken to guard against it. This care of the young, and especially of young colts, is a matter of great importance, and should receive greater attention from farmers than it does. Rest for breeding mares with colts by their sides, is a thing that should not be forgotten, as the plan invariably produces larger and stronger colts. He spoke at some length on the theory of in-and-in breeding, and said that in England, where horses are trained for the turf, more prove to be worthless as trotters than those that succeed as such. He believed that a *continuation* of speed was a test of power in a horse.

Mr. Haines said he had succeeded better in rearing colts to work the mares before the time of foaling. One mare in particular which had been kept quiet before foaling had three colts, all of which failed to live. He then sold her to parties who worked her in a threshing machine, and she had two colts that made excellent horses. He did not believe but that a mare with ringbone would do just as well to breed from as though she had no such fault.

Mr. Prince alluded to the fact that a somewhat celebrated horse owned in Buckfield, and more recently in Augusta, was originally

a pacer, had been trained to be a trotter; but no one could make him trot but his original driver. In regard to feeding, he believed it was the practice of English breeders to give their colts one peck of oats per day when young, and increasing to half a bushel as they grow older. He believed this to be a wrong practice.

Mr. Jefferd's report was accepted and placed at the disposal of the Secretary.

Mr. French presented the following on

The Construction of Farm Buildings.

No subject that engages the attention of the farmer or him who builds for himself a rural home, is more worthy of most careful consideration than the construction of the buildings his wants demand, his conveniences require, or his tastes dictate. It is so intimately connected with his enjoyment, pleasure, prosperity and success, that he can ill afford to pass it carelessly by, or leave it too entirely to those who have no community of interest with him.

Heretofore the facilities enjoyed for procuring building materials cheaply, have been so great, that people have built cheap houses, and as for taste, a man's notion has been his guide rather than any rule of proportion. A change in circumstances, however, begins to work a corresponding change in calculation and estimates, and the greater the cost to us of our comforts and pleasures, the more are they studied, the better appreciated. With all the advantages in location that a choice of situation affords, how few among our farmers avail themselves of the opportunities within their reach, to lay the foundation of structures, that when years shall have filled up the surroundings, will become homes of taste and beauty.

Evidences that such a change is taking place begin to multiply around us, and the occasional expenditure of the vast sums which wealth lavishes upon some of the choicest situations the country affords, serves to improve the tastes of those who are mere imitators, and affords examples for study to those who will originate for themselves. Such lessons will not be lost to those obliged to use their means in a humbler way, not the least among whom may be reckoned our sturdy farmers.

Location is the first thing to be taken into consideration in the projection of a plan for a set of farm buildings; and the question arises, what is a suitable location? If the farmer is beginning anew, or is encumbered with old buildings only, that are of no account, he is free to act in the premises, and can choose an elig-

ible site. Let it be a dry, elevated spot, preferred for its accessibility to the farm, rather than being *in the road.* Let the house first take advantage of the situation, so if possible there may be no standing water around it, at any time or from any source.

Its construction should be simple, compact, convenient in arrangement, and just suited to the wants of those who are to occupy it. Here is where a great mistake is oftentimes made—great, over-grown houses, unsightly, inconvenient, poorly arranged—in fact, ill adapted to what they are designed for; obliging those who use them to put up with a kind of forced construction of what was originally intended. Simplicity becomes a farm house—an exhibition of good taste, rather than an attempt at anything grand and imposing. Size is not always necessary to convenience, and surely the farmer is not expected to build a house for a show-case. The actual amount of room that is necessary for the comfort and convenience of a family, is not large; it is the kind of room they have that makes a house convenient, not the amount. A parlor and living room, each furnished appropriately; a kitchen ample in its arrangements, with buttery or dairy and their appliances, together with what sleeping apartments are required, constitute all that is absolutely necessary for the make-up of a complete farm house. It were far better to take what is oftentimes expended on what is actually waste room, and apply it in rendering the structure more tasteful, and elegant if you please, something that shall give to the house more of a home look, a realization in part of our picture of a *home.* In the grouping of farm buildings, we prefer an eastern or southern front, though a western has its advantages, with the barn to the rear, and if possible situated lower than the house, that all the wash and drainage from the house may be readily conducted to some of the manure yards.

The barn is to be the farmer's store-house of wealth, and on the completeness of its arrangements, its perfection in detail, will much of his success depend. Its internal arrangements should be such that the farmer when visiting his stock, may be able to take in almost at a glance their condition, and in distributing food to them shall not be obliged to perform unnecessary labor.

The yards adjoining the barn, stable or hog-pen, should have no wash; they should be graded to the manure vault, and any surplus water that collects be either retained or conducted to the field by drains or other artificial means for irrigation. The amount thus saved each year is greater than most farmers realize, as it is the

finer and more available parts of manure that first dissolve, and if the water is retained till the rich sediments are deposited and the liquids evaporated, comparatively little is lost. There is no fermentation while manure is under water, and manures that have been once dissolved are in a better condition for plant food. The collection, retention and manufacture of manure is *the* thing of chief importance to the farmer, and any arrangement that best secures the desired end, is best. Each case cannot be specified, every condition cannot be met. Circumstances vary with location and govern in the matter, but this rule obtains anywhere, that the farm yard should be the great receptacle, the reservoir like Mechi's boiling cauldron, taking in and digesting everything the farmer has that may be turned to manurial account.

Barns and other out-buildings are frequently too much scattered. They should if possible be around one yard, and if under one roof so much the better. One large building answering all requirements, is cheaper and more easily kept in repair than several detached ones, as well as a saving of both time and labor in performing its offices. It is not a difficult thing, as some suppose, to bring all our farm stock together and provide for them in one establishment.

Perhaps the majority of farmers are already supplied with the necessary amount of buildings, but suffer from their inconvenience and waste. Let such set about themselves to remedy existing evils. Some plan will suggest itself to the practical man, whereby the greater deficiencies can be overcome.

With existing structures, we let circumstances govern us, instead of attempting to make ourselves masters of the situation, and we have said the house should be compact in its arrangements. Particularly should this be the case with that part of the house devoted to kitchen and family purposes. These rooms should be relatively near each other, surrounding each other, rather than stretching off in a continuous line, as we too often see where ell upon ell is added to the main structure; a step from each to the other being comparatively all that is required in performing their offices. Economy of steps is economy of time and labor, and this principle should prevail in the entire arrangement of farm buildings. As to style, and whether it be one story or two, circumstances and the kind of materials used will govern largely. A farm house may be but a single story in height, yet be convenient and accessible; but the foundation required for the one story is suffi-

cient for two, or what is now more common and very appropriate, the story and a half, equivalent in its accommodation to two. There is one style of architecture so appropriate, so thoroughly English in its composition, and adapting itself so readily to every condition and under all circumstances, that it may be safely recommended for general use—we refer to what is called the Tudor style. It is equally at home in the low cottage, costing no more than $500, or the more desirable house of $5,000. It adapts itself with the same facility, be the material wood, brick, concrete or stone—and here we can but utter a word in favor of more permanent materials in the construction of farm houses. Wood is the common material in this country, which makes a good house and is easy of construction, but demands constant care and repair. There are localities where brick is now nearly as cheap as wood; in others good rift stone exists in abundance, or our common blue stone, or coarser slates with natural faces abound, and can be had for the quarrying. The refuse stone of our granite quarries affords an excellent, and in some places an available material for farm building. For our part we could desire nothing better, and if within our reach would most certainly apply it for the sake of example and to gratify our own taste. We wish those who have the opportunity would become inventors, and by a judicious application of such permanent materials named as may be within their reach, construct moderate sized, plain but neat dwelling houses; cozy homes that shall be to them, their children and their children's children, rendered only the more attractive by age than becoming unsightly through dilapidation and decay. Until such a change is studied or contemplated, we must look in vain for anything like permanency in our homesteads; and until a love for the old home springs from a veneration of old-time scenes and associations, we may not expect a realization of the advantages permanency secures."

The reading of this paper was accompanied with an exhibition of various plans, and by verbal remarks in explanation of the various points to be elucidated as shown in the plans.

Mr. Dana said the great want with us was a class of houses of moderate cost, and coming within the reach of the young farmer just married, and who wishes to start in life for himself. They could not entertain the thought of building a house costing $5,000, one of $1,000 or less being nearer their means. He advised a square house with projecting roof, a large living room, and good

airy sleeping rooms. A parlor was the most useless room in the house, and few farmers had books enough to have a room specially devoted to them. A story and a half house gave poor chambers, and the rooms were ill-fitted for a laboring man to sleep in. He objected to the Tudor style of architecture, as recommended by Mr. French; he did not like the gables and angles always connected with it, for they were always leaking. Two things were of prime importance in building a house—to have a good tight roof and to secure warmth. He had found from sad experience that it was a bad plan to coat or plaster the inside of chimneys, as it very often covers up defects in the masonry, and the coating of mortar soon falls off, leaving the fire to work its way through the defects. It is best to have the brick laid carefully, the interstices being well filled with mortar. It is a fault with our house-builders that they build too much for ostentation and outside show. He cared more for the living room of a house, that it be pleasant and attractive, than he did for a parlor; and if any one could not see him in his living room, he wanted him to keep away. He was not a little surprised, last summer, to see ladies who had been turned out of house and home by the terrible conflagration in Portland, and who had before thought they could only live in splendid houses, come into his neighborhood and live happily in the meanest hovels of houses in the town. He believed if a man would treat a woman in a proper way, showing her respect, loving her as a man should love his wife, she would live with him in a dog kennel, if he could provide nothing better, and be happy.

Mr. Haines agreed with Mr. Dana in regard to the benefit of a two story house, for affording good airy, healthy chambers.

In regard to barn cellars he said that since he had kept his cows in the cellar during the summer,—or allowed the cellar to be kept open in order that the cows could go in when they desired,—he had not noticed one of the worms in their backs, as is always the case with cattle in the spring of the year. By seeking the shade the fly is prevented from laying the eggs that produce the worm.

Mr. Carpenter alluded to the injudicious habit of expending so much in houses as most men do, and then after all have such incongruous and unhandy buildings. The kitchen should be the most convenient room in the house, and more should be expended upon it than upon other parts of the house. The dairy room should open out of the kitchen. The dining and living rooms are also desirable, and next in importance.

Where there is a barn cellar, he would have it so arranged that the cattle from the pasture could go into it at liberty, and they will seek it a large part of the time, especially in hot weather.

Mr. French made some remarks in explanation of his report, and in further explanation of the plans submitted by him. Location is the first matter of importance, and all plans should be made in accordance with the location. He advocated the Tudor style, as applicable to all classes of houses, those costing from $500 to $5,000, and withal ornate. For himself he would never build a one story or a story and a half house. The parlor he thought of little consequence in a farm house, as convenience and comfort should take precedence of mere show and display. He would also have the entire range of farm buildings connected, as no one builds to burn, and while he had them he would enjoy them.

The report was accepted and placed at the disposal of the Secretary.

The action of the Business Committee resulted in the adoption and assignment of topics for investigation and report at the present session, as follows:

1. Under what conditions will agriculture in Maine be most successful? French of Franklin.

2. To what extent can the preparation of the soil for crops be profitably carried in autumn? Smith of Penobscot.

3. In what manner and to what extent should farms be fenced? Prince of Androscoggin.

4. The construction of barns, with reference to the preparation and preservation of manure. Farley of Lincoln.

5. To what extent should mixed husbandry be practiced? Carpenter of Kennebec.

6. Best methods of seeding to grass. Ayer of Waldo.

7. Do health and economy require more attention on the part of our farmers, to the production and use of garden vegetables and fruits? Chamberlain of Maine State Society.

8. The imperfect obligations—as their discharge affects the physical as well as moral health of the farmer and his family. Dana of Cumberland.

9. Are the direct and indirect advantages of sheep husbandry with the present tariff on foreign wool such as to warrant its increase in Maine. Moore of Somerset.

10. Comparative profit of raising cattle or sheep. Holmes of Oxford.

11. By what practicable method, if any, can an effective and useful connection between the Industrial College and the Common Schools be effected? Dyke of Sagadahoc.

12. Can artificial manures be profitably used, and if so, what kinds and to what extent? Wasson of Hancock.

13. Comparative advantages of the culture of Indian corn and the smaller grains. Jefferds of Piscataquis.

14. Culture of Buckwheat. Haines of Aroostook.

Mr. Jefferds submitted the following resolution:

Resolved, That the interests of Maine farmers demand that more attention be given to the production of mutton, both for sale and for the farmer's own table.

In support of it, he remarked that circumstances growing out of the condition of the country for the last ten years, have turned the attention of farmers to raising sheep, and the flocks have increased at a rapid rate. The improvement and increase have been mostly for the production of wool, without much consideration of their mutton qualities. Now let us consider whether we are pursuing the right course—whether *mutton* or *wool* should be the first consideration, in view of our present markets and future prospects of the country.

It is my opinion that the keeping of sheep for the production of wool primarily, cannot be profitably pursued for any length of time in Maine or New England; that the advantages of the far west for sheep husbandry and the portable qualities of wool would so reduce the market price, that we should be obliged to abandon the pursuit. An increased tariff on wool will be only a temporary relief for us, and will hasten the time of its cheap production at home. As yet the natural grazing lands of the United States have hardly been reached by civilization—the Indian, the buffalo, the elk and the wolf have had undisputed possession. These must soon give place to the shepherd and his flocks and herds, producing wool for the New England manufacturer, and meat for the miner engaged in bringing to light the mineral treasures of the mountains. A large part of the vast territory lying west of the Mississippi, comprising more than half the area of the United States, is admirably adapted to sheep husbandry. I believe that the time will soon come when a pound of wool will be produced in the United States cheaper than a pound of cotton ever was (with paid labor) or ever can be. Still I think we should not be discouraged in sheep husbandry. We shall always have the market

for mutton without competition. We can also produce wool that they cannot, while a pound of wool can be transported to any part of the United States for two cents, mutton must be consumed near where it is produced. The climate and condition of these new territories will not be favorable to the production of very fine wool, or the long combing wools for lustrous goods.

The American merino seems to be the sheep for this situation. Our circumstances seem favorable to the raising of the mutton sheep and the wools that some of them produce. Our farms are small, and sheep are usually kept in small flocks; our pastures are rich (when not over-stocked) and forage good. All sheep need shelter, and it costs no more to provide good, than indifferent. Here, then, we have the elements to produce the mutton sheep in perfection, and when we produce good mutton, the market demand will increase. There is but very little good mutton produced in New England, and but few know what good mutton is; while no special pains are taken to produce it. I am a lover of mutton, and prefer it to any other meat. It is the principal meat of my table for a large part of the year. When from home, and mutton is on the bill of fare, I usually call for it; but sometimes find it so strong and *sheepy* that I cannot eat it. I find a great difference in the mutton of my own flock; but can usually select a good mutton sheep by its appearance. The farmer can raise no meat so cheap and convenient for his own table. He can have it fresh or corned at any time, and it would be cheaper and more healthy to substitute it for much of the pork now used.

The resolution was adopted.

Mr. Dana introduced the following, accompanied by some remarks:

Resolved, That sheep husbandry ought to be encouraged among us, not only as a direct means of support, but also as indirectly tending to maintain the productivity of the soil and thus enable it to support a larger number of producers, and that under conditions more desirable than they now enjoy.

Resolved, That it is the conviction of this Board that this course of husbandry cannot be safely entered upon or advised, as the tariff on wool now is. *They insist* that in justice to our State, the tariff should so be modified as that foreign wool should only be admitted, charged with a burden equivalent to that to which our producers are subjected by sheer force of climatic laws.

On motion of Mr. Wasson the resolves were adopted.

Mr. Moore presented the following:

Resolved, That we advise an increased culture of wheat in this State.

In support of this resolution Mr. Moore spoke at some length of the importance of the culture of wheat in our State. Farmers in his section were devoting more attention to it, and in one instance a farmer had raised two hundred bushels, and had ground it, barrelled it up and sold it to his neighbors. It made a superior quality of flour. Wheat in his section averaged from sixteen to thirty bushels per acre, and he believed a larger breadth than ever before would be sown the coming year. It should be sown as early as possible. The weevil is not now troublesome as it was years ago, no signs of it being seen.

Mr. Dana thought we might return to the culture of winter wheat with a reasonable show of success, but it should be sown earlier than it has generally been; say in August.

Mr. Goodale thought it would be better to send out something more than the simple resolution offered by the gentleman from Somerset, and suggested that a preamble, setting forth why the resolution was offered, should accompany it.

Mr. Haines said Hon. Shepard Cary of Houlton raised great quantities of wheat, and never failed of getting a good crop. He sowed the seed in March, sometimes before the snow had left the ground.

Mr. Ayer had always raised wheat enough to bread his family, and sows when the ground is ready without any reference to weevil. Always wants the frost out, and the land dry enough to be dusty when engaged in harrowing. By early sowing he means April, by late sowing, from middle of May to 20th of June.

Mr. Holmes said the sowing of wheat in his section had largely increased during the past few years. The practice of farmers is to sow early, preparing the land in the fall, and they have been very successful by this mode.

Mr. French said in Franklin county the culture of wheat had never been abandoned. More or less is sown every year, and some seasons give an excellent yield. Early sown wheat does the best. He raises the Scotch Fife, and has taken great pains in selecting the largest heads for seed. One and two hundred bushels of wheat had been raised on some farms in Franklin county the past season.

Mr. Dana proposed the following amendment to Mr. Moore's resolution:

Resolved, That taking into consideration the disappearance of injurious insects, together with the very satisfactory results which have attended the practice of the fall preparation of the soil, connected with sowing and harrowing at the earliest practicable moment in spring, a most extensive cultivation of wheat may be entered on with reasonable grounds of expectation of success, and is accordingly recommended.

This amendment was pretty fully discussed, some members, among them Mr. Jefferds and Mr. Ayer, objected to the last clause, as they thought no particular time for sowing should be recommended. Others favored the amendment and thought farmers could discriminate in regard to the proper time of sowing, the only matter of importance being to bring the matter to the attention of our farmers.

The resolve and amendment were recommitted to Mr. Moore, for further consideration and report, who subsequently presented the following:

Resolved, That in view of the disappearance of injurious insects, and the success of the last few years, together with its superiority as a crop for seeding grass, we recommend a more extensive cultivation of wheat; and while we would by no means discourage late sowing where early sowing is impracticable, we would recommend as a better way, to sow as early as the ground can be worked in the spring.

Mr. Wasson, who was absent when the original resolve was presented, made some remarks upon the general subject of wheat culture in our State, and was glad the matter had been presented to the attention of the Board. He could not, however, agree with that part of the resolve which declared that insects injurious to wheat culture had so far disappeared that wheat culture might be entered upon with a show of success. He believed the most eminent entomologists in our country had declared that insects injurious to the wheat crop, have not materially decreased. Because their choicest food is not furnished them, on account of our not having sown wheat for the past few years, it is no evidence they do not exist among us and subsist upon other food. He would, therefore, propose to amend by inserting in the first line between the words "the" and "disappearace," the word *apparent*.

The amendment was accepted by the mover of the resolutions.

It was afterwards amended by inserting a clause recommending fall manuring and preparation of the land for wheat culture, in which form the resolution was unanimously adopted.

Mr. French offered a report on the first topic presented by the Business Committee, as follows:

Conditions favorable to Agriculture.

"Under what conditions will agriculture in Maine be most successful?"

The agriculture of a State or nation is said to underlie all its other productive industry and forms the real basis of its accumulated weath. This is undoubtedly true primarily. It is the first occupation engaged in by the pioneer opening up a new country; it is the first source from whence he derives subsistence, and the only means for obtaining a livelihood really self-supporting. The earth has always been self-supporting, and its inhabitants in the primitive ages do not appear to have lacked those things absolutely necessary for their material existence; but, allowing to this train of reasoning all the force of argument it may seem to carry with it, it has long since become an established fact among enlightened nations that perfection in detail can only be attained where there is sufficient community of interest to stimulate to the most active production.

There are two conditions under which the agriculture of a State may be said to exist; circumstances which serve to make broad distinction in the industry of a country. One condition is that where the excessive fertility of the soil, the vast areas under cultivation, and the facility with which production is increased, constitute them for the time present and time to come, granaries of the world; the other is where under less favorable circumstances the supply never much exceeds and ofttimes fails to meet the immediate command. The agriculture of our State belongs to the latter class. It has flourished more or less since the felling of the first trees in our once majestic forest, and our farmers have enjoyed a fair degree of prosperity by means of those external aids that have ever been at hand, but now that in the older part of the State these sources of business and of profit are well nigh exhausted, many among us are turning their attention to other branches of industry or hope to better their circumstances by seeking more fertile lands. The advantages derived from the superior intelligence of the people, which society among us enjoys are not sufficient to stop the immense drain our population suffers, so long as the inducements we are able to hold out for obtaining a competence afford so poor a prospect as compared with the rich harvests of more fertile fields.

We have reached a point in our agricultural progress beyond which there cannot be much advance unless new agencies are employed to stimulate production.

Our morality, our intelligence, our scientific attainments, our artificial and mechanical appliances will not avail us till the inexorable law of demand and supply be met. Our thrift and industry would, so far as it lies within our power, furnish the supply, but at present the demand is wanting. Create the demand, and the practical operation of it will do more towards developing and improving our agriculture, than all the essays on worn out lands or theories for the renovation of exhausted soils put forth by the fertile brain of enthusiasts in the art, have ever dreamed of realizing.

The State of Maine to-day with all its advantage of situation and communication, with great storehouses of wealth buried in the earth, with unlimited power lying idle sufficient to set in motion thousands of forms of industry that would bring into and raise up in our midst a great army of producers and consumers, stands gazing passively at the rest of the world as it has for a generation past, envying the prosperity of sister States and wondering why capital does not seek investment in its vast resources. But the ice is broken. The inimical spirit that has steadily repelled all advances in this direction, the worse than inimical, the suicidal legislation that has constantly refused to hold out any inducement to the introduction of corporate industry involving vast capital, for more than a quarter of a century, has been obliged at length to yield to the force of public opinion, and at this hour there seems to be a spirit abroad arousing the people as from a dream, and our legislators hasten, not slow as they have been wont to do, but liberally as they are impelled to, to check the waste occasioned by the disuse of mechanical and agricultural forces. No good and sufficient reason can be given why the results of a combined industry should not be as plainly visible in Maine as it is in Massachusetts, Rhode Island or Connecticut, but even our agriculture, the most favored of our industrial pursuits, is not in so advanced a state as theirs. This does not come because of superior fertility, theirs is inferior to ours; it does not come because of greater mineral wealth or natural motive power, ours is greater than all theirs combined. Their prosperity is owing to the fact that they made use of all the agencies at their command to enlarge their industry and increase their population, and the vast consumption that necessarily takes place creates an unlimited demand which in turn stim-

ulates supply to the utmost. A precisely similar effect will be produced among us when we set like agencies at work, intensified perhaps by reason of our greater advantages, and the indomitable will, the persevering spirit that strives to overcome all difficulties, and has made our agriculture what it is, together with the hope for the future which now sustains it, will be amply rewarded.

England is a mighty power in the world because of the fostering care she has exercised over her industry, and the agriculture over that "barren isle" is a masterly success spite of "cliff," and "down," and "heather." Central Europe is another example of the conditions under which the agriculture of a country is successful, and we may well wonder at the persistent effort that plants a field high up the Alps. China is absolute in condition as in government; it hardly admits of a theory; population is the source whence is the demand and the supply, internal improvements and external trade exercising but a limited influence in its "political economy." So with eastern countries in general; it is their excessive population that imposes upon each the necessity of production. The demand and the supply is comprised in the same individual but the limited source from whence the supply is drawn impels to the most rigid economy and careful consideration of every condition that in any way affects the results of this labor.

The movement now set on foot to build up large manufacturing towns on our great water powers, is a step in the right direction, and a step that once taken we shall never retract. It is estimated that every one hundred thousand spindles adds ten thousand to the population, but suppose it shall be half this number, multiply our capacity by it and what will be the result? Look at Providence, at Springfield, at Lowell, at Lawrence, or Manchester, if you wish for an example of other States; towns springing up all over the old commonwealths of New England till their populations have so increased that they cannot feed them. Is it a wonder that their agriculture flourishes, that their farmers get rich when every nook and corner of arable land is a garden, an orchard, or a field, not even affording room for pasturage in many places, but soiling their cattle and horses as a matter of economy. We can already note similar results in our State at Saco and Biddeford and at Lewiston, but this is only the beginning of the end, the initial point made, from whence is to go forth and springing up all over this State whenever opportunity is afforded, other great enterprises and like interest.

The building up of a great enterprise in any part of the country serves also as a centre round which others of less magnitude revolve, some inseparably connected as a part of the necessary machinery, others drawn in by the mere force of circumstances. If a spirit for manufacturing enterprise seizes upon a people and is fully entered into, there is no limit to its expansion save the demand for its industry and the power to produce a sufficient supply. Maine is eventually to become a manufacturing State, is peculiarly adapted to it, and when the encouragement of such enterprises shall become a fixed principle in our legislative economy, as we believe it already is, there will be no lack of the application of capital to the development of our resources. Here then we strike the key note that is to ring through all the scale, the application of capital to build up other forms of industry in our midst which in turn will receive their support in part or in whole, and stimulate to greater activity those which already exist, one of which is our agriculture. The immediate effect this will have upon our agiculture will be to stimulate production, and cause a division of labor in our productive industry. In the vicinity of our cities and large towns, farms will be sub-divided into gardens for raising fruit and vegetables; a less amount of land employing the labor of a man and affording a much larger return than is now realized. This will diminish the number of acres devoted to field crops and stock raising, while the demand for these great staples of farm production will have increased as has the other, and this demand in turn must be met by increasing the productiveness of the soil or clearing up new lands. Both of these means will be resorted to and thousands of acres that are termed "waste lands" will become fruitful fields bearing rich harvest and adding greatly to the beauty and healthfulness of the country. Under this stimulus the different sections of the State adapted to any special production will be induced to enter into that more exclusively, whether it be grain, or stock, or grass, or wool, or fruit growing, and the excellence attained in either branch in consequence of more exclusive culture will greatly add to the amount of production and the ability to increase it.

Can we conceive of conditions under which our agriculture will be more successful than those named circumstances which will not only stimulate to the greatest development but incite to the highest attainment possible? We have not yet considered the influence which the vast stores of mineral wealth as yet untouched is to exert, nor our shipbuilding interest, nor our coasting trade with

its in-shore fisheries; these will serve greatly to multiply the conditions under which our agriculture will be most successful, and are of themselves inseparably connected with the investment of large capital. If we as a State will fall back upon our own resources, invite capital of our own and from abroad to improve our natural advantages whatever they be, the conditions precedent to a successful agriculture will be already determined, otherwise we remain as we are, a problem for time to work out. The morality and intelligence of our people, the healthfulness of our climate are guarantees of success, and once on the high road, we have no doubt the goal will be reached.

Maine is not an inferior State; it is superior in those resources and national advantages that will eventually sustain in our midst a vast population, but the conditions precedent to all this have not been well observed among us. Our climate is healthful, our soil is fruitful; our sea-coast abounds in harbors, some of which could float the navies of the world; our great rivers having their sources in the water shed that forms our northern boundary, run the entire length of the State and are navigable to the very mill sites on their banks. Great lakes feed those rivers that their waters fail not, and our smaller rivers and streams that come tumbling down from table to table on their way to the main water courses, are the outlets of other lakes and ponds whose waters may be held in check in their natural reservoirs as reserve force. In the bowels of the earth lies our granite and slate, and lime and iron, and other mineral wealth our ears have heard of but our eyes have not seen.

Add to these advantages other circumstances that will serve to increase our prosperity by increasing the great army of consumers by means of which we propose to stimulate to greater activity our agriculture and make it more successful. The State from its situation will be a highway of travel for contiguous States; tourists will flock here to enjoy the June atmosphere of our rural districts with the rich and varied scenery our hills and mountains afford, or to revel in the sports of fishing and the chase among our woods and on our lakes and streams.

What more would we add in this northern clime that we do not already possess as means whereby to increase our material wealth, and render more certain the conditions of our success? Whatever is wanting remains for us to supply by our energy, our enterprise, our foresight, our intelligence, and whenever we combine these with our unlimited means for creating power, our resources that

will bring in wealth, and our natural advantages for enjoying these both as a pleasure and a profit, we have the assurance that success will not delay.

There is a future of Maine, but we must marshal our forces in order to unfold it. We must put in harness the thousands upon thousands of horse-power that now dash wildly off in idle strength without bit or bridle, whose equipage will cost millions, while thousands upon thousands of human hands will be needed to hold the reins of the laboring steeds that spin, and weave, and weld, and fashion. We must bring to our aid these inanimate powers that will work with us and make them animate because of the life they sustain, and the labors they multiply.

Instead of emigration we shall have immigration; our cities will flourish with trade, our valleys will hum with business, our hill-sides will be green with cultivation, our herds will increase, our flocks will multiply, the earth will bring forth of its fruits abundantly, and all the labor of man shall flourish. It will improve the waste places, it will save the old homestead from desecration by the foot of strangers; it will build up all over the State homes of wealth, taste, refinement, and we may hope of happiness.

In our quarries the uplifted sledge will drive the tempered drill; the clip and click of hammer will be heard patiently plying the chipping chisel; over our mines and around our iron works the fiery glow of roaring furnaces will gleam at midnight, while within, midst the lurid glare of forges, athletic men and ponderous engines will combine in a horrid din as they mould and shape the yielding iron, equalling the workshop of Mars when forging the armor of the gods. Our ship-yards will resound with the carpenter's axe more and more, our fishermen will line our bays with trawl and net, our harbors will whiten with sail, steamers will plow our waters, the curling smoke will settle on our river banks as the locomotive speeds along morning and evening to villages and cities grown up by our waterfalls.

All this will be more than realized when we shall have improved to their extent our opportunities, and the conditions will be fully met under which our agriculture will be most successful when our capacity for production is equalled by our consumption.

If any one claims that the picture is too overdrawn, we beg to put in the plea that it is not the original, but a copy, an outline sketch without the coloring. Look for that in the old Bay State, and where every practical form of productive industry practicable has

been fostered and encouraged. Maine deserves better of the world than to be said of it that "it is a good place for men to go from." Let us make it a good place for men to remain in and live in, because of the advantages we can offer them to spend and enjoy a rational life here. There rises before me continually a future that may be, and I had rather live in the expectation of that and strive to realize it, than deprecating what is and holding out no prospect of relief. We ought as citizens of Maine, to honor our State for its worth, show to the world its value, and watch over her interests as our own, not looking back but forward with our aim placed high, not beyond the reach of mortals, but within the probabilities of success."

In the discussion which followed the reading of this report Mr. Dike said:

This is one of the most important subjects which has been brought to the attention of the Board at its present session, or, indeed at any of its sessions. It is one which concerns the welfare of our State. It is one which we, as a Board, ought to commend to the consideration of the people of the State, as a subject of vital interest to them.

Our State—the Dirigo State—why has its growth been so slow, the last quarter or half a century? Not our climate, though this be cold in winter. Not the sunny south alone, has drawn away our people. Not the want of the means of education; for we have been fostering those interests. Towns and cities have had schools and systems of education fully up to any in New England—and to say this, is to say that they are fully up to any in the world, taking everything into consideration. And the parts of the country whither most of our young men and young women have gone, have often afforded comparatively less opportunity for education. But our State has been raising up manly young men to go away into other States, because, more than for any other reason, they have not found the means of getting a living in their own State, equal to those afforded in other States. Our young women have gone to other States because they could earn three, four, five or six dollars per week, as the case may be, in those States, while they could earn little or no ready money at home. And the young men have done the same. The old maxim is "money makes the mare go."

Now the question arises, and it is an important question, what shall be done to retain at home, these young men and young

women? They are the bone, sinew and muscle, as well as mind, of the State—of any State. This State is a State of great resources; but in no department hitherto has it excelled more than in raising men—men of physical as well as intellectual powers. We cannot so well raise corn, or wheat for the great markets of the world. Other fields surpass us in these products. We cannot raise cotton or sugar, they are products of more sunny climes. But we have raised and do raise men; and no State has excelled us; no State has produced stronger, nobler, abler or more useful men. Men who have emigrated from Maine have been foremost men in other States. They have conferred honor upon the State which produced them. But we do not desire to export our products of this character. We do not desire to lead away our young men and young women to find homes in other States. We wish to retain them here among us. We need their physical and intellectual powers to develop the resources, the really immense resources of our own State. We need their assistance, their labor, all their powers at home.

How shall we retain them at home, as well as draw others to us? I answer, by a change of our policy; by the introduction of a system of internal improvements; by intersecting our State with railroads; by using our immense water power; by bringing into our State capital from abroad; and by the introduction of manufactures and the mechanic arts in their thousand forms. The rapid introduction of this new system of State improvements, would soon lead us to cease to export men and women. It would keep our population at home; keep our capital at home and invite capital from abroad. If we look into history we may learn some lessons on this subject. We shall learn that the effect of the introduction of manufactures and the mechanic arts into other countries, has been to change the whole phase of society. This is an age of great physical progress, especially in manufactures and all the branches of the mechanic arts. Without these agencies agriculture would have slept till this day, and without these agencies, it must continue in its present half-sleeping, half-waking state. The great cities of our country, of the world, are quite as much cities of manufactures and of mechanics, as of merchants. If we go back to the days of feudalism—half patriarchal and half military as it was, we shall find that feudalism held everything in slavery, till manufactures and the mechanic arts wrested society out of its death grasp. The triumph of Runnymede—what was it and what

did it amount to till manufactures, and commerce—always dependent upon manufactures—began to quicken vitality which lay dormant in the masses of men? It was these which opened the way for the fusion of the social classes and kindled those aspirations which have beat higher and higher till they have controlled the western nations of Europe.

Let us take one or two examples for the sake of illustration. Mr. Hallam in his history of the middle ages, has ascribed one of the first steps of progress in Europe to the introduction of woollen manufactures into Flanders, nearly six hundred years ago, and so magical was the effect of the introduction of these simple manufactures, that, that little district, since rendered so famous, became a market so distinguished as to invite in merchants and strangers from seventeen different kingdoms, and give them a home in the little capital of a district, whose every avenue was in the course of time palpitating with new life, under the dispensation of the industrial arts, and Flanders sent out its influences all through the free cities of Germany.

England was one of the first countries to discern the effects of this new revelation. She was quick to take the hint and adopt, as she always has been to this day, what will serve her own interests. He who was called the father of English commerce—the great Edward—a title which gave him more claim to the gratitude of his countrymen than being the hero of Cressy—opened a stream from the manufactures of the continent which was continually pouring its life-giving influences into the kingdom of Great Britain. Here was the beginning of England's greatness. Commerce soon began to extend its sway into the Baltic, ships began to be built, ships it is said of nearly a thousand tons capacity, maritime law, and the law of nations took forms, international comity and freedom were cultivated, banks were established, bills of exchange began to be used, those little paper cards which have been often strong enough to bind great and powerful nations together, and manufactures and mechanic arts and trade began to take a position in the nations of the world and be seated on thrones from which they have never come down.

What is it that built up London, and made it what it is now, the greatest and most powerful city in the world? The work shops, the marts of trade, the din of ports, the smoke of towns, the click and whirl of machinery and the incessant sounds which go forth from the places of labor. These works of the laboring classes

built up London, and they continue to sustain it in its greatness to this hour. While Wat Tyler could summon only a rabble around his standard, the great Cromwell could gather vast numbers from the houses of merchants, manufacturers and mechanics—puritans in religion and workmen or laborers—they demonstrated that a new era had opened upon the world, on Marston moor. What enabled John Hampden to stand up so boldly in the defence of the rights of man? It was because a vast array of tradesmen and mechanics stood behind him. They spoke through John Hampden.

Look again at the brilliant triumph of the untaught genius of George Stephenson, when this poor uninstructed mechanic sent his first express train over the Liverpool and Manchester Railroad. That was the trial trip of the age of progress. The humble inventor and engineer then was nobody but a poor mechanic. But there stood a crowd of witnesses, to watch the movement of this first railway train, the greatest men of the age, Brougham, Wellington, &c.; and the freight which this first railway train carried, was all the hopes and all the interests of this new age; and when Dr. Arnold, if not one of the greatest, yet one of the noblest men of the age, when he saw that first train dashing along he said, "I rejoice to think that feudality is gone forever."

I wish I had time to dwell on the fact, but have only time to allude to it by saying that mechanics and artizans were the men who stood behind him and made him bold and ready to confront the domineering power and aristocracy of England; they were the men who, through him and other great leaders, gave independence to our country.

I have occupied your attention too long in the way of illustration, but let me say here that under the renovating influences of the mechanic arts and manufactures, agriculture starts from its sleepy couch as if touched by the wand of the enchanter. Architecture is studied, houses are ventilated, lands are drained, machinery is invented and set to work, and trade and the pursuits of labor become respectable.

In view then of the great importance of the introduction of the mechanic arts and manufactures into our State, on a much more extended scale than hitherto, and of the great influence these shall have in developing the resources of Maine, and of retaining our population at home and drawing in capital from abroad, shall we not, as a Board, put forth all our efforts in this good work? Shall we not send forth word in season and out of season, contributing

our mite, however humble it may be, to promote so desirable an end? Portland, Saco, Biddeford, Lewiston, Lisbon, and many other places too numerous to mention here (and we hope soon to name the city where we are now assembled in the front rank) are beginning the work. But what a mighty power, what resources are slumbering yet on the Kennebec, the Androscoggin, the Penobscot and a host of other places, waiting, not for the moving of the waters, for the waters have been rolling down the long slopes and tumbling over the falls from of old; but waiting for men to come and improve their advantages, to build the blocks and put up the machinery, which, when put in motion, shall card the wool and spin the cotton and weave the cloth that shall clothe the millions. It will be one of the most important words which we can speak from this Board, a word for the good of our State, for the good of our children and posterity if we can say a word that shall tend to push along these vital interests of our State. For one step taken leads to another, and another; one improvement made leads to another. And it is to be hoped that the day is soon to come when envies and rivalries and jealousies between different sections and among cities and towns, shall be done away, and all shall unite, each in its own work, not in suppressing, hindering or overturning another's work; and thus, all shall strive to accomplish the greatest good of the whole.

Our State seems to be particularly adapted to manufactures and the mechanic arts. We not only have immense water power, but our soil is strong and productive, fitting it to produce all those crops needed to sustain a manufacturing population. And while this population can be easily supplied by the products of the land, in their immediate vicinity, they in turn afford markets at the manufacturing centres, scattered all over the different parts of the State. They mutually benefit each other. Agriculture benefits manufactures—manufactures benefits agriculture. What a decided influence the increased population of Lewiston for instance, within the last few years, has had in raising the value of lands and farming operations and products, in its immediate vicinity. This makes farming a paying business. Without a market the enterprising people of Maine never will be content to remain here and try to get a living by farming; for at the best they can get but a bare living, where there is no market, or a very poor one.

Now, if a population of ten thousand have such a decided influence in the vicinity of Lewiston, what would be the effect of a pop-

ulation of a hundred thousand in Lewiston? What would be the effect of many Lewistons scattered over every section of the State? It needs no figures of mine to convey conviction to your minds, or to the minds of the people of Maine; you can judge of this matter as well as I can. You can see that the building up of large manufacturing cities and towns in the different parts of the State, would make good markets in the State, and serve to develop its agricultural resources to a wonderful extent. This is the way to increase the value of land, by increasing the value and demand for the products of the land, by furnishing a good market near the place where the productions of the earth are grown. This seems to me one of the ways of making farming profitable, making it a business of interest to our young men, making it the means of furnishing good homes, comfortable living and an enjoyable mode of life to the great mass of the people, the industrious, laboring people of our State. And it seems to me that if we can say a word to promote the interests of manufactures and the various mechanic arts, and their increased introduction into our State, into our cities and towns and villages, we are by so doing, taking one of the most direct methods of promoting the interests of agriculture, whose interests we have met here to aid and strengthen."

Mr. Goodale remarked that the question involved in this topic was a very important one. It was cast in its present form, by the Business Committee, because that seemed, more likely than some others, to be calculated to bring to view various considerations of especial importance at the present time, and this, because there is now more activity of thought and movement among our people, and more prospect of the development of our natural resources, *provided* thought and movement receive a true direction, than there has been for many years past.

To apprehend the question fairly, it is needful, first, to consider another question lying back of it—namely, in what does successful agriculture consist? Does it consist merely in the ease in which a living can be obtained from the soil—in the extent of one's herds and the fulness of his barns, or does it involve more than this? There is a world of truth in the declaration that "man shall not live by bread alone," and in a true conception, it will be found that the most successful agriculture is not that by which merely the largest crops are gathered, but that by which, with a sufficiency of food and raiment, the man himself becomes greatest and best. Were man only pure and good, he might prosper best, in

the higher sense of the term, in the more fertile regions, but with man as he is, this has never yet been the fact. To man as he *is*, labor is a needful discipline. It was *for man's sake, for his good*, that he was compelled to earn his bread by the sweat of his brow. We read of one, who, when the option was given him, chose a most fertile and goodly land, and what followed? First, "fulness of bread," and next, "abundance of idleness," and in the train of these, such vices as have caused the very name of Sodom and Gomorroh to pass into a by-word and a hissing, and their locality to be represented upon the map by the Dead Sea. What happened then and there has measurably come to pass in every place and every age since, and will for ages to come. Exemption from labor ought not to be sought, for labor is a blessing and not a curse. Relief from exhausting toil we may earnestly desire, and we may attain to it also, just in the proportion that labor is *intelligently* directed to *useful* ends. For in proportion as man attains to wisdom and goodness, labor ceases to be a needful discipline and becomes a delight. The world is full of illustrations of these truths. Look at the inhabitants of tropical regions—whether in Asia, Africa, or America—where no labor is required to obtain subsistence, because the earth brings forth abundantly of itself. Would you change your condition, on the whole, for theirs? Look at the more favored temperate regions of our own land, the sunny south, or the fertile regions of the west, inhabited by our brethren, the descendants of a common ancestry. In what particular are they better off than we? Do they enjoy better health? Are they better fed and clothed? Are they warmer in winter or cooler in summer? Are their social, educational or religious privileges greater than ours? Are the rights of person and property more sacredly protected? Or, to descend to a lower level, and merely material comparison; is it found to-day, as a matter of fact, that an acre of land in Georgia or Illinois produces a crop which commands any more money than an acre in Maine? Nobody doubts that the western farmer can grow forty or fifty bushels of corn on an acre of rich prairie with much less outlay for manure and labor than we can; but when it is harvested, what is its purchasing power? He cannot build a house of corn. His wife cannot make clothes of it, nor can they educate their children upon it. Existence can be protracted upon hog and hominy, but what is such existence worth? His corn is worth to him what it can be exchanged for, and what this is depends almost wholly upon the length of the

road and the difficulties of the way between him and the consumer. We are told much has been used for fuel. I believe the Maine farmer can procure cheaper fuel than prairie grown corn, for the latter, besides the gathering, requires plowing and planting.

I do not propose to discuss the subject at length, but I would like to contribute my mite towards a correct appreciation of the points involved in it, for I do not, as many do, believe that a fertile soil and a mild climate are indispensable conditions for successful agriculture. It may succeed wherever good crops can be *extorted* from a soil of moderate natural fertility—an unwilling soil, if you please to call it so—by labor *skilfully* directed and economically applied, and with the aid of all available fertilizers, whether animal, vegetable or mineral, *provided* there be also by its side a well remunerated and diversified industry which needs and can afford to pay for what the farmer grows. Include in the proviso elevation of intellect and purity of heart also, and what better can be desired! The question of our topic has already been considered and a conclusion reached, whether right or wrong, by thousands beside ourselves—by every young man or old man who has asked himself, shall I remain in my native State, or shall I try to grow corn or raise sheep at the west, or sugar or cotton at the south, or wool in Buenos Ayres; in short, by every one who has at any time proposed to better his lot by pursuing any form of agriculture elsewhere—and other thousands will decide the same question in years to come. It was with the hope that a true light might be shed over some of the data which should enter into the calculations that the topic was proposed.

Mr. Prince submitted report, on the third topic, as follows:

Farm Fencing.

"In what manner and to what extent should our farms be fenced?"

In passing through the different sections of our State, or even in the same neighborhood, one will see almost every variety of structure that man has ever invented to inclose his farm, from the substantial stone wall to a hedge of the smallest bushes, that perishes with every winter, and these, too, with little system, giving evidence that this subject has not received the careful thought that its importance demands.

In 1860, there were in this State, 53,956 farms of more than

twenty acres each, and upon each of these it is estimated that there is at least, five hundred rods of fence, making an aggregate of 26,978,000 rods. At least, two thirds of this is of wood and liable to be repaired or rebuilt every season. This at the small outlay of ten cents per rod will make an annual expenditure of nearly $200,000, and increasing with the price of wood and timber. The almost unlimited water power distributed through all sections of our State, together with our increasing railroad facilities and seaboard, render it certain that we shall soon rank among the leading manufacturing States, and as manufacturing towns are built up, wood and timber will become more valuable and the fencing of our farms a greater burden.

It can but be seen that we do not realize the importance of this question. That the thousands that it now costs us annually to fence our farms must soon increase to millions, and be burdensome in the extreme.

The question arises, can we have a cheaper and more systematic mode of enclosing our farms? We are not prepared to answer this question, but believe that if the same thought was bestowed upon this subject, the same amount of money expended in experimenting, that there is upon many things of much less importance, that some method of fencing might be found that would not only beautify and adorn the landscape, but be less expensive and more substantial than the unsightly fences that now meet the eye on every hand. Can there not be found some bush or tree that can be planted, and with a little care make a fence that would last a lifetime? or cannot some method be invented by which the soil itself may be made into a permanent fence?

The question of the extent to which our farms should be fenced, we are aware has caused some thought, and is a question upon which our best farmers are divided; many holding that we should enclose nothing but our pastures, while others believe that no farm can be cultivated to advantage without both field and pasture being thoroughly fenced. Your writer belongs to the latter class and would not have any field or pasture contain more than twenty acres, and would prefer them much less; the owner can then change from pasture to field and from field to pasture at his pleasure, and thereby add much to the fertility of his farm. Pastures, especially in the older portions of the State, are not at present producing but a small portion of the feed that they are capable of, even at a small outly. We can call to mind many that are at

present almost useless from being covered with ferns, mosses, &c., that are capable of cultivation and would produce bountiful crops without additional dressing; but they contain in many cases, from fifty to one hundred each, and the owner feels that it is too great a tax to undertake to renovate so large an area. The consequence is, it is left as it is found, an ill-looking, unproductive spot.

In conclusion, we say to the farmers of Maine, do not be satisfied with the present "slip-shod" method of fencing, but look at this matter more thoughtfully; institute experiments and carefully note the results, and in due time you will emerge from this chaotic state and receive the reward due for your well directed labors.

Mr. Carpenter had no fault to find with the report, but was somewhat at a loss to see what was recommended. An embankment fence, with the grass growing upon it, and a live fence, were both pretty objects to look upon, but had been found impracticable. He alluded to the advantages and disadvantages of having fields fenced in, and said that for himself he liked to have a farm well fenced—all of it. He felt safer to have his crops well protected by something more than the pin to a neighbor's barnyard gate. It is true, it looks neat, clean and beautiful, to have farms cultivated close to the ruts, but for all that he did not like the plan. The matter of fencing was an expensive one, and where we have wooden fences, the subject really becomes quite serious in view of the great cost of keeping them in good condition.

Mr. Farley regarded the matter of fencing as a great burden, hence, it should be a point with all farmers to build a fence that should last a lifetime—making them of a permanent character. In his section, a fence made of pickets with an iron post and stone foot, was becoming quite common in open fields devoid of stone. It would last for twenty-five or thirty years, and made an excellent fence. The system of having open fields can only be successfully carried out in communities where farmers are disposed to do right and take care of their own cattle. Where fences are necessary, the most substantial ones are the cheapest. Better build a picket fence, than to patch up a fence every year with long straight sticks from the forests that in a few years would make excellent and valuable timber, and in the aggregate throughout the State, amount to a large sum annually.

Mr. Wasson made some remarks upon the subject. He alluded to the law of the State in regard to impounding cattle, and called

the attention of the legislators who were present to the fact that some measure should be adopted whereby every person should be made to take care of his cattle and keep them upon his own farm.

Mr. Perley objected to so many fences as are common on most farms, because they form a harbor for so many weeds and bushes. He would prefer a single wall to a double wall; it is easier repaired, and if well laid would lay as well as a double one. Double walls were a great harbor for weeds. The seeds fall into the middle of the wall and it is hard work to get at them to destroy them. Fences are expensive, and he thought the least number he could get along with the better. In building a wall, he would first put a trench under it, as it would stand better and act as a partial drain, and weeds would not take root in them so readily. A movable fence was very desirable in some locations, where one wishes to change from field to pasture. Pastures should be the place for fences, and if pastures and outside of mowing fields were well fenced, we should be better off than we are now.

A law should be made obliging every person to take care of his own cattle; not to allow them upon land of his neighbors. From personal inquiries he had found that it cost sixteen and a third cents per rod annually to keep a board fence in order. Farmers were not aware what a burden this made upon them. It was wholly a matter of education only, whether we have fence or no fence, and he hoped the Board would not adjourn until it had taken some action in this matter.

Mr. Goodale said the treatment of the fence question was involved in difficulties, but in his view the greatest difficulty and the bottom trouble of all was a lack of appreciation of the rights of those whose lands joined the highways and who in fact owned the road itself, only they had yielded their claims while so used. When public roads are established the public have a perfect right to use them *for roads*, but no right whatever to use them for pasture, nor for any other purpose than as a highway, simply to pass over them. And when a road is discontinued, even this right reverts, and the title is as perfect as before it was taken for a highway.

In order to arrive at satisfactory conclusions about fence taxes and fence nuisances, and to carry these conclusions into general practice, we need, first of all, an enlightened public sentiment which shall *comprehend and respect the rights* of those whose lands are taken for public use *as highways only*. Let such a sentiment

prevail generally and all other related matters can be determined with comparative ease.

Mr. Wasson said acres and acres of land in our State are remaining useless, because fencing cannot be had, and its cost debars the young man from taking it as a farm. In his section were numerous farmers whose only pasture for their cows is the highway, and if they do any damage where is the remedy?

Mr. French said he found single wall better than double wall, and especially for road fence as less likely to drift. The matter of fence and no fence must work itself out gradually, and cannot be changed arbitrarily. Gradually a revolution is going on. Our laws in relation to this matter are sufficient already, to keep the cattle from the highway, and he believed it could be done.

Mr. Ayer thought any farmer who had plenty of stone or cedar, better use it and have good fences.

The report was accepted and placed at the disposal of the Secretary.

Mr. Farley submitted the following report on topic number four, viz:

The Construction of Barns, with reference to the Preservation and Preparation of Manures.

I made known to your Business Committee my willingness to prepare a paper on this subject, because I have given to it some personal attention and because I consider it of real interest in all its details, and especially with reference to the preservation and preparation of manures. I am aware that much has already been written upon this topic, but in my judgment the agricultural classes of Maine have not yet been sufficiently aroused to its vital importance, as the great step which they must take towards making their pursuit comparatively easy, as well as profitable.

At the outset of what I have to say, I lay it down as a "fixed fact," that agriculture in Maine cannot be successfully prosecuted without an abundant supply of manures of some description. How can they be furnished? or, rather, how can every citizen directly interested in the cultivation of the soil, be enabled to procure for his annual use, such an amount as he requires for keeping in good condition the land he now has under cultivation and be able yearly to add to it, by the reclaiming of worn out fields or the clearing of forest lands. With this view of the subject, which I desire particularly to press upon your attention, it is readily perceived, that

it comes home to the interest of every farmer and gardener in Maine.

I have formed the opinion, that it is not within the means of the large majority of our farmers to avail themselves of artificial manures; that being beyond their reach, some way must be devised, by which they can obtain their necessary supplies without going off their own farms. The question is practical, and deserves a practical answer. I think it is answered, so far as is possible under the circumstances of the case, by the construction of barns with close or open cellars, so that the solid and liquid manures made in them may be saved from waste, evaporation or washing away, and so deposited as to allow of an admixture of muck, top-soil, rock-weed, leaves, straw, or any other substance suitable for absorbents and compost. I think it may be said with entire correctness, that with the barn arrangements as they now exist in this State, more than one-half of the animal manure made during the season stock are "housed," to use a farmer's word, is lost. I know of no kind of property in which there is such a waste. I am unable to form an estimate of the value thus annually wasted in this State; but a moment's reflection will satisfy any one, that it must be enormous. Consider what an improved condition of agriculture in every branch of it suited to our climate, we should enjoy, if what is annually wasted on the great majority of our farms, could be saved and applied to our hungry soil. I have the impression, that no such thriftless system prevails in old civilized countries, but one just the reverse; particularly in England, to say nothing of the immense quantities of manure imported into that country, which, it appears from a paper read here during our present sitting, reach an astonishing figure in their cost, and is striking evidence of the importance the sagacious people of that busy island attach to agriculture, prosecuted under unfavorable natural advantages. Now, I contend, that with barns properly constructed, this great and foolish waste of animal manures may in a very great measure be obviated; that the manure heap may be largely increased by the addition of absorbents and compost matter; that the animal manure thus saved will bear such an addition, and that the increased heap will possess sufficient strength for the production of the leading crops of the State. For top-dressing purposes, with reference to the raising of hay crops, I have heard the opinion frequently expressed and such is my own, that animal manures composted with other substances are preferable to clear manure,

for the reason that the composted article operates not only as a manure, but as an addition to the soil itself, which is required in the top-dressing of sandy, gravelly fields. To what extent animal manures thus saved, will bear an addition of compost matter, will of course be best determined from experience. For top-dressing purposes, I think five times the quantity of compost substances may be added, if of good quality.

The increase in the aggregate crops of the State which would necessarily follow upon such a revolution in the antiquated system of preserving manures, would soon be apparent, yielding to thousands a *surplus*, where now they only realize a sufficiency for domestic consumption. With such a change, farming would become comparatively profitable in Maine. Under its influence, State and town indebtedness would operate only as temporary inconveniences, and our whole population would experience the advantage following from an improved agriculture, which always has been, and from the nature of things must continue to be, the leading pursuit of mankind.

I sometimes feel that if most of the barns in Maine, conspicuous for their unsightly manure windows, could be destroyed, the farmers, as a class, would be better off, if in rebuilding, they would construct them on the plan I am advocating. The disposition too generally exists originating in false notions of economy, or an attachment to old things, to retain the barn erected by the father, or some ancestor of the occupant, not adapted to the modern standard of what such buildings should be, in any one particular, while the owner, in most cases, has on his own farm the lumber and other materials requisite for a better structure, which by the exercise of a little energy, the application of his own labor and a prudent expenditure, is within his reach. That expenditure will not be speculative; its returns will be a surety; they are immediate and cannot fail. Let the improved building be according to the ability of its owner. The system is adapted for all; its benefits can be reached by the owner of a single cow and one acre of land, as well as by the owner of a large stock and hundreds of acres. It possesses the merit of general application and accomplishment.

Probably nine-tenths of all our farms have within their boundaries the materials, either salt or fresh muck, top-soil or rock-weed, required for composting, the deposit of which spring and fall, in suitable proportions to the solid and liquid manures dropped in the

barns of the owners of these farms, that much despised animal, to be found the year through, upon a well managed farm, the vulgar yet indispensable hog, will do almost everything else requisite to prepare the heap for use. Unless our supplies of manure can be steadily increased, I do not understand how agriculture in Maine can be advanced and a surplus of products secured to the man who lives by the cultivation of the soil. He may hold his own and that is about all. Every generation of farmers must leave off as it commenced. The hay crop of Maine is, I take it, the leading crop of the State, annually increasing in demand and value. I think it is conceded, that after a field is cleared of rocks and bushes, well seeded and laid down, that the easiest and cheapest mode by which it can be kept in grass is by top-dressing. Where is the top-dressing to come from? I have endeavored to answer that question by the recommendation of a system which is neither expensive or impracticable. If our fields can only be kept in good heart, by frequent breaking up and planting, then their increase in extent must, from the nature of the case, be slow, and the labor of men and oxen continue to be exacting, because that mode of obtaining a hay crop is more laborious and expensive, than the simpler and readier one of top-dressing.

To barns constructed as I have recommended, I am not aware that any objections can be brought which do not admit of a satisfactory answer. To that sometimes made against a cellar, closed during the winter and nearly tight, that the odor and steam from the manure will be injurious to the hay, my answer is, that by ventilation, by means of a wooden ventilator, ten or twelve inches square, constructed of boards, (one or more ventilators, according to the size of the building) running just through the barn floor and extending upward into the ventilator upon the roof, that objection is completely obviated with but little expense, the draft upward through the ventilator acting like that of a chimney, and in that way all the foul air in the cellar escapes. In the construction of cellars upon wet, springy soils, care should be taken to prevent the entrance of water, by laying an underdrain directly under their walls, or by some other mode.

I will only add that in urging these views for the consideration of that class who comprise now, as they always will, the most numerous portion of our fellow citizens, I bring to the support of the conclusions to which I have arrived, the results of my own personal experience."

In the discussion which followed, Mr. Wasson said there were some sentiments in the report to which he could subscribe, and some to which he could not. The question alluded to in the report, "how and by what means can we add to the manure heap?" was *the* question of greatest importance. True, barns can be so constructed as to facilitate the work of adding thereto, which is one method. The report says it is not within the means of a large majority of farmers to purchase artificial manures, and he questioned if this should go out to the farmers of Maine as the sentiment of the Board. He spoke at some length upon the subject of muck as a manure, giving an account of its composition, use, &c. Barns should be so constructed as to prevent the loss and waste of manure, as in the way in which a large number of our barns throughout the State are constructed, great loss in manure is occasioned. He could not subscribe to the language in the report that compost was better than animal manure. He knew it was a favorite opinion of Liebig, but it did not agree with his opinion or experience.

Mr. Dana said that the remark in the report, that the majority of our farmers could not afford to purchase artificial manures, was too broad a statement. He regarded dry loam as the best absorbent for cellars and vaults, as by its use offensive odors are got rid of, and the quantity of manure increased. Where he could not get loam, he used sand. It was used as a bedding, and by its use the stables were kept dry, and it acted as a divider. He had used considerable quantities of marine manure, and his men were obliged to get it immediately after haying. It had been a question with him, whether this was cheaper than it would have been to have kept his men at work to produce crops to sell to purchase manure. He spoke in high terms of the Cumberland Bone Company's Superphosphate. Had used Coe's to a considerable extent. The first year it proved very good; but he had used it two years since with no perceptible advantage whatever.

Mr. Prince said it was a question with many, whether a barn cellar should be wet or dry. Some add water to their manure, others keep it dry. Again, should cellars be so constructed that they will freeze or not? Some farmers like to have the manure made in winter freeze, others do not. He saw no benefit that could arise from composting where manure was to be composted with soil and applied to land where the soil was of the same character as the soil that was used in composting. He had been erecting a

barn the past season, and had constructed the leanto, for cattle, fourteen feet wide, and behind the cattle was a raised platform or walk, between which and the cattle were scuttles for dumping the manure into the cellar.

Mr. Carpenter submitted a report on fifth topic, which, at his request, was recommitted, to be presented in a new draft at the next session.

Mr. Ayer submitted a report on topic number six, "Best methods of seeding to grass," the copy of which has since been mislaid. The following notes of a discussion which followed were saved.

Mr. Moore said he thought the report should have indicated the best crop to seed down with.

Mr. Ayer replied that he regarded wheat as by far the best crop to seed down with.

Mr. Haines was of the same opinion as Mr. Ayer, and regarded barley as the second best.

Mr. Dana expressed the opinion that as a general thing farmers did not put on half enough grass seed. This should be avoided, as it would be found a paying operation in more ways than one if more seed was used.

Mr. Dike spoke of autumn seeding, as a matter of great importance, and also alluded to the great loss sustained by our farmers being too penurious of their grass seed. A farmer cannot spend his money to better advantage than in buying and using a large quantity of grass seed. He advocated keeping the manure pretty near the top of the ground, and covering the seed by a light harrowing. He thought the fodder corn crop of great value as a means of obtaining forage, and as an addition to the short pastures of autumn. In curing it after it was cut, he did not allow it to remain out over night, but set it up in the barn, loose, without binding, and after it had stood in the floor for several days it was sufficiently cured to put away in other parts of the barn. Had used poultry manure as a dressing for corn to most excellent advantage, and regarded it as one of the most valuable fertilizers the farm afforded. It was too apt to be wasted.

Mr. Prince could not get his land thoroughly enough pulverized to seed down, until the third year after breaking up. Thought the best mode of manuring was to cultivate lightly near the surface. There is a great difference of opinion among farmers as to the best kind of clover seed to seed down with, whether northern or wes-

tern. He believed in sowing our northern seed at the rate of fifteen or twenty pounds to the acre in connection with a sufficient amount of herdsgrass, and believed it would yield a good return. He sowed his seed in the spring, but would inquire if any had practiced seeding in the fall.

Mr. Haines said the western clover seed was sown to considerable extent in Aroostook county, but it killed out badly the second year, and he believed the farmers missed it in sowing western or southern clover seeds.

Mr. Farley stated, as he had already done before, that he sowed red top seed upon the surface. He advocated mixed grasses as a food for stock and therefore thought it necessary to sow a variety of seed. This he regarded as a matter of great importance.

Mr. Moore spoke at some length, giving the result of his experience in the manuring and seeding down of grass land. Had received but little benefit from plowing under manure in seeding to grass. Southern clover seed had succeeded very well with him, and had given good satisfaction.

Mr. Dana spoke of the injurious practice of allowing cattle to feed off the after growth of mowing lands, as it was absolutely necessary in order to protect the roots of the grass from the injurious effects of frost.

The following notes are also retained of a discussion in informal session of a kindred subject in the following resolve :

Resolved, That the clearing up of meadows and lands bordering upon meadows, is a cheap and profitable mode for obtaining hay crops.

Mr. Farley regarded the soil of meadows as far richer than that of uplands, and thought it less expensive to prepare meadow lands for the production of grass than to prepare upland. No stones are encountered upon meadows. For draining meadows he would recommend an open drain, as an under drain would not always carry off the water. For upland meadows, a proper underdrain would be preferable. From his experience in underdraining, both upon meadows or upland, he was satisfied he had been well paid for all the time and money expended. To this our farmers should resort for the purpose of increasing their hay crops, and it was the most available source at hand.

Mr. Brown of the House of Representatives, was called upon for some remarks, and stated his experience in draining. He regarded it a most important matter, and farming in Maine he looked upon

with a different view now from what he did before he went west. Years ago he regarded Maine as only good to grow lumber and emigrate from, but now he regarded it as one of the first States, agriculturally, in the Union. When he came on to his little farm he found a large swamp which produced but little grass, and that of a poor quality, and he at once drained it, putting in stone drains. He thought it better to put stone into a drain promiscuously, than to put them in in any other form. After draining, it was plowed, a crop of corn and potatoes taken off, then a crop of barley, and since then it has been in grass. In some cases it has produced at the rate of three tons per acre. Our State is a great grass producing State, and stock raising is one of our most profitable branches of husbandry,—more so than we are apt to think. He raised sixty-five bushels of spring wheat from two bushels sowing, sown the middle of May, upon land that had been drained. He had received great benefit from using muscle-bed upon his land, and it had been applied to his orchard with good results.

Mr. Kenniston of the House of Representatives, in answer to a call from Mr. Farley, said he had for the last ten or fifteen years, practiced draining to considerable extent. The drains were formed of stone; in some places the stone were first placed upon a plank, on account of the softness of the land. They were about six rods apart, eighteen inches wide, and two feet deep. The products of his drained land had more than doubled since the operation had been performed. He had used sea manure quite extensively. Last season used three tons of fish guano, applied to corn, potatoes, roots, grain and grass, simply as an experiment, and it proved most successful. He was satisfied it was more profitable to consume hay on the farm than to sell it. Upon a field of three hundred acres, lying upon an arm of land extending into the sea, he has now two hundred sheep, and has not fed them for three years. About one eighth of it is covered with wood, and in winter they live on spruce and fir browse, rockweed, kelp, &c., and they come out better in the spring than many flocks kept confined in the yard. They house among the thick evergreen growth, and have all they want to eat. His lambs come from the first to the fifteenth of May, and he has dressed them in September that have weighed thirty-two pounds to the carcass. In one instance, after a severe storm, he fed them some hay, they atê a little, trod over it, and left a large part on the ground, showing that they were not in want of food. The soil he had drained was a clear muck,

ten feet deep, and was formed of decomposed vegetable matter. He had raised red top for some years, but did not like it so well as herds grass.

Mr. Farley had sown red top seed in the chaff, upon a meadow, and it had succeeded admirably. It was grown in connection with red clover and herds grass, and it made superior fodder. It was sown upon the surface. He described his method of laying stones for an underdrain, in order to prevent their being filled up, which was, to first lay stones on each side of the drain, then lay in as a bottom stone, a stone that is wide enough to fill up the space between the side stones. This prevents their being pressed in and filling up the space for the water to course through. Upon the top, place a stone large enough to reach across them, then fill in with small stone, and a complete drain is formed.

Mr. Dike gave his experience in draining a piece of land some ten years ago. The land was covered with a black alder growth, the soil was a muck; and since draining, it has produced at the rate of three tons of grass per acre. The drains were about four feet deep. The advantages of underdraining were, that it was applicable to any land, and to all seasons. In making his drains, he first paved the bottom of the drain before laying the stone for the drain. After the drain is laid, turf is put upon the stone, before the earth is filled in. Such land as he had described was among the most valuable in the State.

Mr. Wasson inquired the cost of ditching for drains.

Mr. Farley replied that under favorable circumstances, two men would dig from eight to ten rods of ditch per day, having the ditch two and one-half feet deep, and fifteen inches wide at the bottom. In answer to a question, he stated that he considered two and a half feet in depth equally as effective, upon most soils in our State, as three and a half feet.

Mr. Jefferds said that many farmers who had upon their farms unimproved meadow land, were often obliged to purchase a ton of hay in the spring (in order to carry their stock through) at a cost of fifteen dollars. Now this fifteen dollars expended in clearing up the meadows upon their farms, would fit them to yield the extra ton of hay, and that not for one year only, but perpetually. It was a matter of much importance, and was too much overlooked.

Mr. Ayer said he thought it would pay for a young man to hire money to expend in improving and clearing up the meadow land

upon his farm. If it would pay to run in debt for more land, under certain circumstances, he thought it would also pay to run in debt for the purpose of improving the land already owned, where the return was as sure and large, as it has invariably proved upon lands of like character, in various parts of the State, that have been reclaimed.

Mr. Carpenter spoke of the large crops of hay annually taken from some of the so called water meadows in some parts of Massachusetts, that were only manured in the rains that fell upon them, with no other application, which proved that there was great manurial value to the rain that fell from heaven. In one instance the water of a stream had been carried through the privies of a large manufacturing establishment, which added to the fertility of the meadows.

Mr. Chamberlain submitted the following report on topic number seven :

The use of Fruit and Vegetables.

"Do health and economy require more attention, on the part of our farmers to the production and use of garden vegetables and fruits?"

With a little analysis, the inquiry seems to resolve itself thus: Do we—as animals living on a mixed diet—consume too little of the vegetable and too much animal food? Does health require that the proportions of our food should be changed, giving an increase to the vegetable? Can we make such change economically?

The food of man seems to be determined by his climatic condition. Within the tropics it may be purely vegetable; in arctic regions entirely animal; man's demand and nature's supply coinciding in each extreme of climate. In intermediate climes, man originally found many kinds of animals, grains and fruits on which to feed. Here, as elsewhere, nature worked in harmony—man's physical demands modified by climate, and that climate producing the essentials to supply that demand. Man subsisting on mixed food, embracing a wide range of the animal and vegetable kingdoms, is seen in his highest type. Physically and mentally he excels the fruit and root-eaters of hot countries, the crowded millions of rice-eating Asiatics, and the flesh-eaters of the north. But man in temperate climes is now seen under varied incidental conditions affecting supply of food. At present, millions are living

unnaturally. Physical wants are not supplied. Production—supply, having been committed to him in the great economy, he is sometimes seen to fail in keeping production up to the ratio of increase of his kind. This is only seen as a local ill. Old nations, employed largely in other arts than that of agriculture, find an excess of population to be fed, at times, through the channels of commerce. Under such circumstances multitudes are scantily fed with the cheapest and easiest supplied food; the flesh of animals and fish rarely entering into the supply. The physiologist may not be able to obtain the data for a comparison of the man of central Europe, to-day, with him of two thousand years ago; but the comparison may be instituted between the people of different countries, of the same origin, but existing under different circumstances as to supply and kind of food.

In our own country, food in its variety has generally been abundant. Our climate is more variable in the seasons than is seen in corresponding latitudes on the other continent. We live and labor in summers almost tropical, and through winters almost frigid. Instinctively we consume large quantities of meat and other nitrogenous food to keep up animal heat in winter, and in summer our gastronomic pleasure is in the vegetable kingdom. But through habit, our people furnish their tables with meats in the warm season, and when a waning appetite notifies us that we are giving such dishes too prominent a place, appetite is invoked by the use of condiments. We thus do violence to our nature and lay the foundation for many diseases which become hereditary. Our national habits of living have become very artificial—a wide departure from the simplicity of our forefathers. Though we may claim superiority physically and mentally, to the over-worked and underfed millions of the old nations, yet in comparison with our ancestors the result is thought not to be in our favor.

We are now able to have warm houses and abundant clothing; and may we not use them as substitutes in part for azotized food? May not animal heat be thus maintained at less expenditure for internal combustion, and with less violence to the laws of nature? We here touch a matter of such magnitude, that we cannot otherwise render so good service as through a quotation from another:*

"The forces of the living body are expended as they are generated in the performance of the vital and voluntary functions. The proportion employed in voluntary effort is greater or less according

* Man and his Relations, by S. B. Brittan.

to the perfection of the organic structure, combination of the temperaments, the temporal necessities and incidental circumstances of the individual. So long as physical exercise is regulated—as to the seasons and the modes—by an enlightened judgment, and otherwise graduated by the normal capabilities of the constitution, it serves to strengthen respiration, to accelerate the processes of vital chemistry, to increase the measure of animal electricity; and thus to promote a free, natural and vigorous action of all the organs. But it is no less true that excessive toil diminishes the latent powers of life, enervates the organs, and restrains their appropriate functions, until by degrees the recuperative energies are fairly exhausted, and the whole system sinks under the weight of its unnatural burden.

The intelligent reader will perceive the reasons why too much exercise of the body is liable to interrupt the organic harmony, whenever we labor excessively—or beyond the limitations which nature has prescribed for the government of the individual—we make perpetual and unreasonable demands on such springs and resources of vital powers as legitimately belong to the involuntary organs and their functions. These drafts are only honored at the expense of health, and it may be, at the sacrifice of life. When once we reach the proper limit of our powers of endurance, every additional hour spent in physical exertion, extracts some portion of the life-principle from each separate organ in the vital system, or diverts the same from its appropriate channel. The pulsation becomes labored, digestion is impaired, the liver is rendered inert, the powers of thought languish, the will relaxes its purpose and resigns its object, while the whole man suffers from consequent enervation.

Excessive *alimentiveness*, with rapid and imperfect mastication, is liable to disturb the balance of nervous power and to derange the functions. It imposes an unnatural burden on a particular organ, and hence calls the vital electricity from other portions of the system to the stomach, in an undue degree, to the end that the process of digestion may be accelerated. Several times a day an avalanche descends with fearful momentum—elements gross and ponderable—while mingling torrents, hot and cold, follow in rapid succession. For a while the work goes on without any perceptible interruption. Nature applies all her forces to clean the way and make room for whatever may come next. The secretions are all increased beyond the normal limit, and the whole system is

required to perform extra labor, which soon indisposes the individual to voluntary effort. A sluggish state of mind and body succeeds with a tendency to indolent habits. At length the oppressed and overburdened organs—so long restrained and obstructed in their functions—lose their vigor, and the reaction prostrates the whole system. The man is ill, and a wise Providence destroys his appetite, that nature may have time for the elimination of the superfluous matter in the body.

Such men resemble mills that have been running night and day to crack, grind and bolt the grain of the neighborhood; or, they may be regarded as vast receptacles of decaying vegetation, and respectable locomotive sepulchres for the rest of the animal creation! Omnivorous mortals! your greatest triumphs among the elements and forms of matter have been achieved through the concentrated powers of the *gastric juice!* Unlike Bunyan's pilgrim, who had the good sense to shoulder the bundle of iniquities, you impose upon the stomach the enormous and crushing weight of your manifold transgressions."

Our national habit in a pernicious course of diet has become so obvious through results, that we now find much written upon it. A pioneer in the west, thus writes in advocacy of fruits as food, and their tendency to promote health of system and morality of character: "The free use of ripe fruits not only *prevents disease,* but their regulated enjoyment helps to remove that which already exists. All ripe fruits are more or less nutritious. Professor Salisbury has clearly demonstrated that the apple is superior to the potato, in the principles that go to increase the muscle and the brain of man, and in fattening properties it is nearly equal, when cooked, for swine, or fed raw to other domestic animals."

Other fruits are remedial agents. "Ripe grapes have cured epidemic dysentery." Figs are safely used as food in convalescence. Blackberries and black raspberries prevent and cure "bowel complaints." "Families, where fruits are most plentiful and good, and prized as an article of daily food, are most free from disease of all kinds." The vegetable food of very many families living in the country, has consisted in the grains that make our bread, beans, potatoes and apples. These, with meats, milk and its products, make up the "bill of fare" for the year, with very little of additions or variations. In such a "course," the articles of meats, bread and beans, are presented in a form too concentrated, and should be diluted with additions of fruits and green vegetables.

The kitchen garden has not yet become a general and an important appendage to the farm. We should now learn how to live well—better than many of us have—by reducing our consumption of meat, and making our dinners more of vegetables. To this end we shall make the garden an object of annual and daily care. We shall produce a considerable variety of vegetables, to which our climate seems well adapted. We will name some as worthy of a prominent place: Beet, carrot, parsnip, cabbage, onion, turnip, squash, rhubarb, tomato, bean, pea, sweet corn—in their variety, asparagus, salsify, artichoke, radish, horseradish, melon, cucumber, to which should be added several herbs and seeds as condiments.

The matter of "small fruits" having been often considered at the Board, will not be entered upon here. One question remains: As our habit has been, can we substitute vegetable, for a portion of animal food, with economy? This question suggests another: At what expense of vegetable consumption is our meat produced? Admitting certain facts to be pretty well settled by experiments, we may state that a growing animal, or a cow in milk, consumes in good hay, about three per cent. per day of their own weight; that it takes eleven pounds of milk to increase the weight of a calf one pound. Some experiments show that 315 pounds of potatoes, 548 pounds of beets, 676 pounds of swedes, and 382 pounds of carrots, are each equivalent to 100 pounds of hay. An ox weighing 1,300 pounds, will keep up his weight upon about 22 pounds of good hay per diem. Put up to fatten, he will require 44 pounds, upon which he would gain about two pounds per day. Substituting equivalents for one-half the hay, and we have 69.3 pounds of potatoes, 120.4 pounds beets, 148.7 pounds swedes, or 84 pounds of carrots added to 22 pounds of hay for daily feed, to produce two pounds of beef—live weight. One experiment in feeding hogs—given in Boussingault's "Rural Economy"—shows four animals each nine months old, weighing 458.2 pounds. At the end of twenty-one days they weighed 620.8 pounds—increase 162.6 pounds; to obtain which there were consumed,—barley, 151 pounds, beans, 140.8 pounds, malt grains, 440 pounds—equivalent in nutrition to 1,229 pounds of hay, or 3,871 pounds of potatoes. So that the quantity of nutritive matter represented by 100 pounds of hay, produced 13.21 pounds of live weight. Otherwise expressed, 64.5 bushels of potatoes produced 162.6 pounds of live hog. Another experiment, in which seven hogs, fifteen months old, and in good condition, were put up to fatten. Their weight was 1,691.8 pounds.

At the end of 104 days they had gained 409.2 pounds. They consumed 772 pounds of barley, 1,042.8 pounds peas, and 9,504 pounds potatoes. Giving equivalents we have 26,245 pounds of potatoes. In this experiment the provender equivalent to 100 pounds of hay, gave 4.91 pounds of live weight. Or 456 bushels of potatoes made 409 pounds live pork.

Mutton is fattened at a cost about the same as beef. With such proof of expenditure in vegetables for the production of animals, we conclude that course is true economy which feeds ourselves on the products of the garden, the orchard and field, reducing our animal food to its minimum, beyond which vital energy will be lessened and our usefulness abridged. Some experiments in this field of inquiry will not harm us. We know many families who have nearly cut off their consumption of pork, with evident advantage. A willingness to examine this matter may be a mark of wisdom."

Report accepted with little discussion, and no dissentient voice.

Mr. Dana presented the following report on topic eighth, viz:

"*The Imperfect Obligations—as their discharge affects the physical as well as moral health of the farmer and his family.*"

The wise ordering of the farm is not confined to growth of crops, the preparation of soils, the breeding of cattle, or the sustentation of animal life. The crops are necessary, and so are the cattle under the sheds; and so too, but in a far higher sense, the physical health and spiritual well-being of the husbandman himself, and of those who are gathered under his roof-tree and committed to his charge. The first range themselves under the head of thrift, or domestic and external economy; the last are matters of vital concern. But the last should be first.

"Imperfect obligations" is a term used by text writers to denote a class of duties of the very highest type—without a conscientious discharge of which, indeed, is neither domestic health or happiness, nor national comity. *They* are perfect; it is the law which is imperfect—because they are of that subtle quality that human law has no adequate sanction wherewith to enforce their observance. Yet, nevertheless, each individual being finds himself handicapped with them from the start. "He runs a race, he carries weight," says the poet—and it becomes the rider, if he would win, to adjust his weight in such manner that it shall not gall him nor impede his course. It is proper that the citizen and the farmer should each

adjust and manage these weights, according to his several style of going.

I speak now to the farmer's style and to *his* peculiar burden. It is plain to see that he is subjected to a particular class of these obligations, and also, that owing to his necessarily isolated condition, certain of them bear with greater weight upon him than upon those who live in cities, because his failure to perform them is attended with more disastrous consequences, both to him and to his family, than is ordinarily the case with those who have opportunities for immediate compensation upon any supposed neglect or inattentiveness on the part of the acknowledged head.

In the conduct of his life, both as regards his own well-being and that of his family, the farmer has certainly a very difficult part to perform. He has not only so to elevate his thought as to secure his own moral and physical health, but to so carry himself toward his family as to preserve theirs. In his relations with them he must epitomize the virtues in his own being; be wise for counsel, patient under pressure, generous in spirit and demeanor, worthy in example, forbearing in speech, attentive to, and even anticipating wants, quick in sympathy, and cheerful always—for he is the head of the household, and he has pitched his tent apart from others, and all these things are demanded and *he must supply the demand*, he must furnish all, do all and be all. This is difficult—all beautiful things are difficult; but it is only by overcoming difficulties we attain at last the desired end.

We are, Mr. President, of mature years. In crossing the isthmus of life that divides between the two eternities, we have reached that high table-land of observation from which we can best look, not only before and after, but around. In doing this, for myself, and from a farmer's stand-point and with his experience, I find that much of our unhappiness and the uneasy feeling and consequent ill health prevailing in our families, is occasioned by the negligent manner of our discharge of some of these imperfect obligations.

Without physical health there can be no desirable life; and just as surely as the mind is affected by bodily disease, so surely does the mental condition react upon the external organs. Accordingly in the few words I have to say, I shall speak mainly to the point that as a matter of *economy*, it is proper to pay more attention to the discharge of these obligations.

To begin at the beginning. It is of the last importance that the

farmer should duly appreciate the dignity of his calling. Without this appreciation, he is in a perpetual state of unrest himself, and inevitably communicates a feeling of disquietude to his family. With it he is in a condition to spread over them a feeling of repose. It depends upon him whether the life shall be one of exalted labor, or the merest task work in the world—the one to be shirked from, the other to be willingly accepted and conscientiously discharged.

But if, impelled by the highest considerations, he enters upon the discharge of his duties, he is at once beset with the difficulties peculiarly incident to his condition. In his haste to secure a competency, or arrive at independence, as he calls it, he is not only apt to overwork himself, but to allow his wife to do the same. He grows stiff in body, and his mind sympathizes with the outward induration. He comes to pay little or no attention to the amenities. In dealing with his household, he fails to fulfil the obligation of perpetual cheerfulness, and the result is most unfortunate. It is certainly natural for a man who has done a hard day's work in the field to come home tired and impatient. He has done a good day's work out of doors, he has discharged that duty; now let him attend conscientiously to the discharge of the sub[redacted] and more difficult duties that await him in doors. Let him be patient, over any apparent delay in ministering to his wants, and extend a ready sympathy to one whose work has had to be done between walls, and not in the eye of the blessed life-giving sun—whose physical energies have been taxed to the uttermost, while she has been yielding of her vital essence to the incessant, unreasoning demands of an infant.

If he withhold obedience to these laws, or only discharges them in a niggardly or churlish manner, he need expect neither health nor happiness in the house. He should bear about cheerfulness as one would wear a habit. He has his choice, whether to be a benignant father of the family, or an accursed death's-head to drive away appetite from those who are gathered around his board. For as he bears himself, so, in great measure, will the members of his household bear themselves. They are pervaded by the atmosphere with which he surrounds himself. If he does not watch over his actions, and check the tendency to grow unyielding and unlovely, if he does not carry forward into his years somewhat of the feeling of youth, he will shortly find himself a stranger in his own household—his wife grown apart from him, and thin and old, while his

children are anything but the companions they should be, and would be but for his perverse inattention to a few simple laws.

The effect of this unobservance may be found in the constant uneasiness of our young men and women—their desire to "leave home" to go anywhere *away*, and in the further fearful fact that the greater proportion of the inmates of our Insane Asylums is made up of farmers' wives; and this too, where these children and these wives have been brought up amid surroundings, that, with proper attention on the part of the head of the family, would *ensure* contentment and health. The farmer should each day, if necessary, withdraw his regards for a few moments from turnips and intend his thought upon the real welfare of his family, if he expects either to lead or bestow a desirable life. Inasmuch as he finds that, by force of his situation, his bearing has such immense influence on the well-being of those committed to him, by so much should he school himself in being, doing and not doing. Indeed, the farmer cannot divest himself of the responsible discharge of these subtle duties. If his wife or children lack companionship because of the distance between them and others, or if there is no getting to school, or to the church, he must discharge the obligation he assumed when he segregated them from others and the opportunity of readily supplying these needs. He may not think to discharge these duties by being a successful farmer; he of all men is required to *live a right life*, because, he of all men is perpetually in immediate contact with the members of his family; and they insensibly, yet inevitably take their tone from him. His life would certainly be more genial and his duties bear less heavily on him, if he could be brought to outgrow some of the educational twists to which he was subjected in his youth. I think we unnecessarily add to the rigors of our climate, by a mode of life and so of education, which tends to asperate. We 'extend' to undue length the protest 'noted' by our Puritan ancestors, when they reached these shores after a somewhat stormy passage. The dangers of those seas were long since overcome. We are surrounded with perils incident to our present situation, which we overlook in our busy copying of those stern virtues that seem so native to our climate. Would it not be well to think, occasionally, that with the disappearance of the dangers that beset them, it might be well to relax the tension a little, and be gentle? Certainly I think it would, if to be so were not so much more difficult than to be hard; but difficult or facile, that style of life must be attained before we can hope

for physical or moral health and happiness. We produce in our thought and dealing with our families the grim lines of our forefathers, while we are shocked at the want of taste in those who continue to carry about with them ancestral guns, as if savages still lurked in ambush.

Understand me! I do not propose to put a maudlin sentimentality in place of these virtues, but suggest that a reasonable relaxation of the severity which we have inherited, is at this time allowable, inasmuch as the necessities which called them forth have mainly disappeared, and their place should be supplied by milder forms.

The most glaring and mischievous of our derelictions of duty is to be found in our conduct towards the members of our households. We do not pay sufficient attention to the *necessities* of our children. We know well that if we would have a flourishing tree, we must not place the roots in sour soil; and that if we expect to have a thriving animal, we take care that it shall *thrive from the very start.* We know that it will never recover fully from early inattetion and neglect. By as much as a child is of a higher organization and value than a plant or a calf, by so much more serious and lasting is the injury he is subjected to, by our neglect to make his youth as genial as possible. It is in the power of a parent in the narrowest circumstances to secure this, while the wealth of a millionaire often fails of it. We should begin by elevating our own thought and conduct, so that our children shall find in us an example worthy of imitation; for youth is quick to observe and to imitate; and also we should carefully acquaint ourselves with their peculiar or individual natures. When they find that we understand and know them, and sympathize with their wants and trials, and that we are rather wise companions than stern censors; that, indeed, we can talk with them as well as to them, they will gradually attach themselves to us, and so readily yield to counsel that it will seldom be necessary to resort to command. By no means should we attempt, from motives of economy, to deprive our children of the occasional vents and innocent escapades which are necessary to their years. "Youth," says Goethe, "is intoxication without wine." He who, from a desire to economize steam, stops the nozzle of his teakettle, will be apt to shortly hear a disturbance in his kitchen. And he who from similar motives, or from utter unobservance of natural laws, unduly loads the human safety valve with which all young people are by nature furnished, is very likely

to subject the entire neighborhood to the sound and wind of an explosion, which, with proper handling of the living force, would be avoided, unnecessary as it is disatrous to the individual and inexplicable to the community.

It is no part of wisdom to attempt to suppress these uprisings, for they are not to be suppressed, but rather to be regulated and guided in their utterance. It is our duty to admit, not only their reasonableness, but in most cases, considering years, their absolute necessity. When we admit this, and afford the requisite scope, nature will soon free itself, and they will willingly allow their attention to be withdrawn from consideration of these things we have found in our experience to be transitory, and fix their regards on what they agree with us to be the ultimate."

Leave was granted to Messrs. Moore of Somerset, Holmes of Oxford, and Jefferds of Piscataquis, to present their several reports on the ninth, tenth and thirteenth topics at the next session of Board.

Mr. Dike of Sagadahoc, presented a report on eleventh topic, but earnestly desiring more time than the present session could afford, for the investigation and study of a subject of such novelty, importance and practical difficulty, the report was, at his request, recommitted.

Mr. Wasson presented the following report (topic number twelve) on the

Use of Artificial Fertilizers.

"Can artificial manures be profitably used by farmers, and if so, what kinds, and to what extent?"

These are important questions, but like some others, no simple, definite answer can be given, which will be equally adapted to all cases. To the farmer, tilling a virgin soil in Aroostook, the thought of buying artificial fertilizers might seem absurd. But so many of us as till lands, which have been giving up their elements of fertility for ten, twenty, fifty or perhaps, for even one hundred years, and have meanwhile had a return made to them of perhaps, not more than a tenth or one-fourth as much as has been taken away, are in a very different position. All such farmers need to apply fertilizers of some sort, and if home resources are insufficient, as they usually are, then he must go *outside* his farm to get them.

The soil untilled for a single year, would leave famine to spread

over the earth; and a system of depletion without adequate compensation, tends to the same results. Of too many it may be said, that when their lands fail to give remunerative returns, they think of but one remaining available resource, mainly, to sell out and go west; there to try over again, the same depleting, *skinning* process. It is a resource of ignorance. A knowledge of the laws which govern production—the constituents of soils, of the requirements of plants, and how to supply deficiencies,

> "Would give dissimilar, yet unfruitful lands,
> The *food*, the grain, or herb or plant demands."

Wherever adequate returns can be made to the soil without paying out money, we do not recommend the purchase of fertilizers; wherever such returns cannot be made without purchasing, we say buy them. So much for the first question of the topic.

Now for the second, which is, "what kinds?" This opens an almost illimitable field. It is vividly suggestive of reams of foolscap. Lack of health and strength forbid our indulging in more than a glance over it, and in this glance, we notice three which occupy positions greatly elevated above the others, and to these we confine our remarks: 1st, Plaster; 2d, Fish Guano; 3d, Superphosphate.

With regard to the first, plaster, we need make no extended remark. Its value in some localities is great, in others it appears to be utterly valueless, and no one can predict with any certainty whether it will be useful or useless on any given crop. The rationalé of its operations, has as yet, escaped discovery. The wits of the accutest chemists have pried into the secret these forty years and more, and they are just as wise to-day as they were then, and no wiser. Whether the wonderful effects which sometimes follow its use, are due to the sulphuric acid or to the lime, of which two constituents it is composed, or whether to neither separately, but to the peculiar effect of the two combined; or whether, if to none of these, it be due to some indirect influence, nobody has yet uttered anything wiser than an opinion; call it a guess, if you please, it will be as near the fact. But plaster, fortunately, is cheap, and everybody can cheaply ask the question of his own soils, whether a dose of it would do them good or not (he never need fear any harm) and be sure of an answer, which he can depend upon, quite as safely, as if he had paid a $50 fee for it to a professional chemist.

Next we come to fish guano. This as everybody knows, is the

dried refuse of the porgie fishing carried on for the procuring of oil. Large quantities are made along our coast, of which the greater part is sold to go to other States. When well prepared, it may be easily transported long distances. It is exceedingly rich in nitrogenous matter, which is readily given out as ammonia, and proves an exceedingly active stimulant to nearly all cultivated plants. It also contains a considerable percentage of phosphate. The more extensively and judiciously it is used, the more it is prized. Those who have experimented most, are satisfied that its value has not been fully developed. Enough, however, is known to warrant us in saying that it possesses a wonderfully stimulating power.

We now come to the third article alluded to above, to wit: super-phosphate of lime. The discovery of the fertilizing virtues of this substance, is due to the famous German chemist Liebig, who made the announcement about the year 1840. It may be deemed to be the greatest agricultural improvement of the age. Its introduction into general use in Europe was rapid, and for fifteen years or more, it has been largely manufactured in the United States. Its employment, although sadly retarded at times by reason of imperfection of manufacture, the use of poor materials, and sometimes vile adulterations, has been pretty steadily on the increase, until it has come to be generally well known and appreciated. For the successful culture of corn in our short seasons, we consider it an almost indispensable necessity, inasmuch, as it frequently determines between a good crop and a miserable failure. Nor is its employment less successful in the culture of roots, especially the turnip, beet and carrot. Upon exhausted pasture lands, it has given highly satisfactory results. Indeed we know of no other way of renovating worn-out pastures, inaccessible to cultivation except in the use of artificial manures. To say the least, it is the cheapest method. Many an article has been palmed off upon farmers called super-phosphate, which if not worthless, is simply an exchange of a poor fertilizer for good money.

In this connection we are glad to say, we in Maine have an establishment for the manufacture of this valuable and much needed fertilizer. From the testimonials of those who have used the article made by the Cumberland Bone Company, no doubt can exist as to its excellence. We congratulate our farmers on the fact that a fully reliable article is within their reach, and that they can avail themselves of it without any fear of being swindled.

In brief response to the last inquiry "to what extent," we say, we ought not to use them in the place of farm-yard manure, nor of any home resource for fertilization, but in addition to them—as auxiliary to them—and also largely with the end in view of thereby being enabled through the increase of our crops and their consumption at home, of increasing our home supply of manure during years to come to a corresponding degree; and as a closing thought, as many farmers (whether the majority or not) can afford to use artificial fertilizers, or to underdrain, or to do other things for the good of their lands, as have money at interest, and to the extent of such investments, whether five dollars, five hundred dollars, or five thousand dollars."

In the discussion which followed, Mr. Goodale remarked that the inquiries of the topic under consideration involve matters of such magnitude as to warrant close and thorough investigation. The opinion of one member of the Board has been given that the majority of our farmers cannot *afford* to buy artificial fertilizers. He does not intimate that these same farmers do not need them. What then is to be inferred, but that they cannot afford to be successful? For it is undoubtedly true that, when we survey the whole field of agricultural operations, we find (that wherever manures are used at all,) the highest success prevails in those countries and districts where artificial manures are most freely used to make up the deficiency of home supplies. This is as true as it is that, in the same sections, the greatest economy and skill are put forth in the saving and utilizing all which the home farm can supply.

The positions of the report are, in my opinion, well taken. With regard to plaster, it is impossible to foretell its effects upon any given soil, with any tolerable certainty, without actual trial. The fact is unquestionable that it oftentimes returns tenfold its cost, and at others no effect is perceived.

In the year 1861, I gave considerable attention to the matter of marine manures, and the subject formed the staple of my report for that year. Among these, fish guano holds a prominent place. In fact, it is the only one available to the inland farmer. As you are probably aware, fish guano is a side product of the manufacture of fish oil. This branch of industry has greatly increased since the date of the report before alluded to. Along our coast line are now found numerous large establishments furnished with steam

boilers, hydraulic presses and other apparatus for conducting the business on a large scale, where six years ago there were only open kettles and hand presses. It is the refuse of these establishments, variously termed fish "pomace," "scrap" and "chum" which should be the basis of a good fish guano. As soon as it comes from the press, the cake ought to be broken up and thoroughly dried at once. Afterwards it should be ground and barrelled. But hitherto, comparatively little attention has been paid to this refuse. The profits on oil making, have frequently been very large; in some cases a fortune has been accumulated from a single year's operations, and the refuse was thrown aside to bring what it might. Its price has increased a good deal, for whereas formerly it was sold at fifty cents a cart load, it now commands from ten to twenty dollars a ton, varying with its condition and the demand. For the most part this fish refuse goes out of the State, and either Massachusetts, Connecticut, Pennsylvania or Maryland uses more of it than Maine does. Thousands of tons are thus annually exported, and go to enrich other sections, while our hungry fields at home are allowed to cry in vain for more manure. Let the reasons for it be what they may, the fact is obvious that the farmers of Maine are less willing to expend their money for artificial fertilizers than are the farmers of other States. One reason may be that, doing business on a smaller scale they require larger profits, and this reason may be deemed valid to a certain extent. The large merchant may be content with two and a-half or five per cent. profit and realize more income from it than the retail dealer who sells the same goods at ten, twenty-five or even fifty per cent. advance on the cost. But how many farmers are content with a profit of twenty-five or even fifty per cent. on what they expend for manure? How many who spend ten dollars are content with less than twenty or thirty dollars in return? One would not expect to find a trader or manufacturer lending money at six or eight per cent., when by using it in his business he could make it bring in twenty per cent., but would it excite any surprise to find a farmer doing this same thing? No harm would come of it, if farmers would have more faith in their business and be willing to invest more of their means in manure, in drains and in the other improvements which will pay good interest. Another reason is that they are sometimes deceived or cheated in the artificial manures which they buy. A very good reason this for caution, but not for rejecting altogether; any more than because they some-

times take a bad bill, that bank notes should be refused altogether. If there was no genuine, there would be no inducement to counterfeit.

Artificial manures fail to possess the virtues expected of them from a variety of causes. Thus the cheap guanoes come from countries where rain falls, and the soluble portions get washed out; and little remains of any value whatever except some insoluble phosphates. Poudrette is usually made from nightsoil which has already parted with most of its efficacy before it comes into the manufacturer's hands. Peruvian guano is sometimes adulterated largely with sand or soil. Super-phosphate is sometimes made of inferior materials, and not unfrequently is mixed with muck and dirt and other cheap stuff. The frequent failures attending the use of what is sold for fish guano, arise from loss by reason of the rapidly perishable nature of the pomace, chum or scrap. If rapidly and immediately dried there need be no difficulty in preserving its fertilizing properties, but if neglected, it soon passes into fermentation, flies swarm around by millions and ere long it appears a crawling mass of corruption, consisting chiefly of large maggots; ammonia is evolved freely and rapidly, and between the loss by decomposition and the thieving by maggots and flies, there is soon left only a mass composed of bones and scales and stench, the manurial value of which is trifling. Now it seems a very easy thing to prevent this loss by simply drying it immediately after the oil is pressed out, but in practice it is not found to be so easy as it seems. If the fish could be got in uniform quantities daily, arrangements could be made to do so without great difficulty, but as a matter of fact, they come only at intervals, longer and shorter, and sometimes in enormous quantities for a few days together, then no more for a month or longer. I was informed of one instance where, during the past season, enough fish were taken, cooked and pressed during two weeks in July, at one establishment, to make about sixty tons of pomace, and no more until September, when about as much more was made in another fortnight or less. Under such circumstances it is easier to say what is desirable and proper, than it is to effect it. Practically, the result is, that a large part of what is barrelled up and sold is in one of three conditions. It may be wet and soft, leaking a slimy, putrid liquid, or the cask may be found about half or two-thirds full of a drier remainder, mostly scales and bones, or it may be found more nearly full of a mass from which the ammonia is mostly gone, and an

abundance of maggots, or empty maggot cases left in place of the substance of the fish. Sometimes, when barrelled, salt, or lime, or plaster is added with a view to preserve it, but I have never known much success to attend these additions.

Notwithstanding all the drawbacks, there is a considerable amount secured in tolerable condition, and really possessing value, if properly used. Within a year or two, a somewhat better method of preserving the virtues of large quantities at very short notice has been adopted in some cases, and the result is that the average quality of what is sold is better than in the years previous. The value of fish guano, when properly prepared, (and it has very little if not well treated) lies in the fact that it contains a considerable proportion of nitrogenous substances which yield ammonia in their decomposition in the soil. Ammonia is highly stimulating to the growth of plants and enables them to push along vigorously, provided the other necessary constituents are also in the soil. Fish guano also contains phosphate of lime, but comparatively a small amount. So where fish guano is freely used without supplying phosphates and other ash constituents of plants, there is liability to exhaustion of the soil by reason of the large crops obtained, and which the farmer may think can be repeated for years in succession by subsequent additions of the fish guano, while in fact, this has but enabled the more rapid drawing out from the soil of what was in it.

The chief uses of fish guano are, first, for the growth of grass—and when the manure yielded by the consumption of the hay grown as a result of the use of the fish guano is returned to the same ground, a high degree of fertility can not only be established, but fully maintained. Second, for use in old gardens where there has come to be considerable accumulations of plant food yet in an inert and unavailable condition.

Mr. Haines presented the following on the

Culture of Buckwheat.

This grain is extensively grown in the northeastern part of the State, and is so well adapted to the climate and the wants of the inhabitants, that I consider it one of our most important crops. A large portion of our landholders work at lumbering in winter, and generally return to their farms late in spring; consequently their crops are put in late. This crop matures in about ninety days from the sowing of the seed. It is the principal constituent

in the living of quite a portion of the inhabitants of Aroostook county. The bran and the whole grain fattens their beef, pork and poultry. To the farmer who wishes to make the most from his farm, it is also an important crop, as he can raise it as cheap as he can oats, and one bushel of it is worth two of oats for making beef, pork or mutton. When used for feeding purposes, the flour and bran are not separated; and we get from 30 to 33 lbs. per bushel. When wanted separately, the bolt divides it in about equal parts. The flour sells with us at three or four cents per pound. I am told by those who use the flour in their families, that it is worth as much as wheat-flour, and I have had workmen who preferred it at the same price. I have no doubt there is as much nutriment in it as in wheat-flour of the same weight.

If sown on land in high condition, it will lodge and not yield so much as on land in a lower state of cultivation. It will grow on quite poor soil, and will yield a good crop for several successive years without seeming to make such soil poorer. It is thought to receive a large share of its nutriment from the atmosphere through its great amount of leaves. From the short time required to mature the crop, it is not sown till most other crops are put in; consequently the farmer can put in more crops by raising it. It is easier harvested than any other grain crop. The best way to harvest is to cradle, and set it up in small bunches and let it stand until dry; or it may be mown and raked in small bunches—following the scythe closely. It is a grain that will not sprout at harvest time. The poor man without a barn may raise it. It is best threshed on a bed made of small poles, supported at a suitable height from the ground—the grain falling beneath. It is ready to go to the mill at any time. It is a good crop for weedy land. The weeds that have started before sowing time are then plowed under. The crop comes up in a few days, and grows so rapidly as soon to shade the ground and give the weeds no room.

Of the two varieties we prefer the rough seed, as it is not so liable to blight; and it yields more, and the flour is as good as from the smooth variety. Millers are liable to mistake in grinding too close. If the mill is set so close as to grind any of the hull, the flour becomes dark in color and bitter. The hull only needs to be cracked, as the particles of flour seem to separate without any aid when the hull is cracked."

Some dissent was expressed as to the estimate of the nutritive

value of buckwheat as food, compared with other grains. In view of the standing rule of the Board* and of the rapidly advancing estimation in which it is held as a profitable crop, especially in the northern part of the State, the report was accepted and placed at the disposal of the Secretary.

On the 29th day of January the Board adjourned without day.

* "It is understood that the Board does not endorse the peculiar views, theories or assertions advanced in the reports of Committees and papers prepared by individuals, but it does become responsible for the correctness of the principles and recommendations contained in the resolves which may be appended to such reports and papers."

ON THE CHEMISTRY OF MANURES.

There has never been a period in the world's history when so much attention was generally given to the pursuit of Natural Science, in all its departments and ramifications, as the present. This fact forms one of the most prominently marked features of the age in which we live; and those devoted to the pursuit of agriculture share in the movement not less than others.

There is a growing conviction among farmers that the relations of science to practice ought to be better understood; that no one who wishes to farm successfully can afford to be without some knowledge of the scientific principles of his art. Inquiry has arisen in the minds of many into the grounds and reasons of those agricultural practices which have long prevailed, and which have passed unchallenged during such a period that the memory of man scarcely runneth to the contrary. Books, treating of the subject, have been sought and studied by many who, twenty years ago, would hardly have bestowed a thought upon the matter; but not always have books been consulted with unmixed edification.

Extravagant expectations of the easy growth of farm products in largely increased amount, by the aid of chemistry, have too often been indulged in; and when these hopes fail to be realized, reaction is almost sure to set in, accompanied with a corresponding under-valuation of scientific knowledge.

Among writers on the chemistry of agriculture, none has been more extensively read than Baron Liebig. His eminent position and brilliant reputation as a man of great scientific attainments, to which he is undoubtedly entitled, have contributed much to this popularity, though more is due to his clear and forcible style,—dealing with scientific truths in a bold and original manner; investing with a charm even the most abstruse problems of science, and producing a strong impression, both by his own earnestness, and by the importance of the conclusions to which he comes. In the enthusiasm thus begotten, the unscientific reader is almost certain, in common with the Giessen Professor himself, at times, to lose sight of the line of demarkation, which in such investigations

should be kept clearly in view, between the positive fact and the hypothetical inference; which, however probable, is, after all, merely a suggestion requiring to be substantiated by experiment. The consequence is, that comparatively few of Liebig's readers, on a first reading, at least, fail to accept, with equal readiness and confidence, both the facts and the hypotheses so ably presented.

Considerations analogous to the above-mentioned have led to the belief, that an occasional paper on some of the relations of science to agricultural practice, of a character somewhat more abstruse and less popular than usually occupy the pages of reports like this, might be found acceptable and instructive to a growing class among the farmers of Maine; and with this thought in mind the following* is submitted.

By the term manure, we understand any material used in agriculture and horticulture for the purpose and with the effect of accelerating vegetation, or of increasing the production of cultivated plants. In the ordinary and more limited sense, it signifies the accumulated refuse of the dwellings, stables and barnyards of the farmer, including animal excreta, decaying remains of plants, &c., &c.

In addition to these kinds of manure which are produced upon the farm as the results of its internal economy, or obtained in the immediate neighborhood of the land to which they are applied, a variety of other substances are employed for the same purpose, under the name of *Artificial Manure*. These are chiefly obtained by the farmer from abroad, and oftentimes from great distances, according to their value. They comprise ground bones, superphosphates, (which may be prepared either from bones, raw or burnt, or from phosphatic minerals, coprolites and the like,) fish chum, ammonia salts, nitrates, the dried refuse of slaughter houses, poudrette, (or night soil mixed with loam and muck and dried,) the refuse of various manufactures, and artificial saline mixtures.

The fertilizing influence of manure is a fact which has been established by universal experience wherever the cultivation of plants has been practised. In agriculture—considered as that branch of industry which is concerned in the manufacture of food for man and domesticated animals, and therefore the most import-

* It is proper to say, that in its preparation, free use has been made of a paper on the same general subject, which recently appeared in England by B. H. Paul, Ph. D. It is equally just to add that Dr. Paul is not responsible for all the views presented.

ant art of civilized life—manure may be considered as being, to a large extent, the raw material employed.

A complete knowledge of the causes to which the efficacy of manure is due, and of the mode in which it acts, would comprise the whole chemistry of agriculture. The right management of the manure naturally resulting from systematic agriculture is the basis on which rests the profitable practice of the art, the fundamental principle which should regulate all the operations of the farm and determine all their details. It is only by means of such knowledge that it can be possible to improve methods of culture to the highest degree. It is also needed to enable one to make the best selection and use of other materials besides those furnished by home resources in order to render most effective the natural sources of fertility.

The principles involved in the action of manure are still but imperfectly understood, yet to some extent they are deducible from that knowledge of the general phenomena of vegetation which has been acquired chiefly within the present century and has begun to assume consistency and system only within the last five and twenty years. The data upon which that knowledge rests were contributed chiefly by the successive researches of Priestly, Ingenhousz, Sennebier, Woodhouse, Saussure and Davy. But though they afforded materials for a view of the chemistry of vegetation, more correct than that which considered decaying animal and vegetable substances as the chief food of plants, they were, for some time, little regarded; and though the researches of Saussure were conducted with special reference to agricultural practice, still the "humus" theory of plant nutrition held its ground, and was adopted by Davy in his lectures on the "Elements of Agricultural Chemistry," delivered before the British Board of Agriculture between 1802 and 1812. In those lectures he did little more than state the general problem to be solved in the application of chemistry to agriculture and insist upon the important relation between the science and the art; but they afford some remarkable illustrations of the correct appreciation of natural facts which was characteristic of his genius.

Following in the track of Saussure's researches, Boussingault entered upon the study of the same subject, conducting his experments on a much larger scale, and with a more direct reference to agricultural practice than had hitherto been attempted. In England, Lawes was also led, by the suggestive work of Saussure, to

study the effects of various earthy and saline substances upon the growth of different plants, and the researches of both have been continued to the present time. Boussingault's first papers on the subject were published in 1836, and in the year 1839 he had made known results of his investigation which—besides establishing the composition of the most important kinds of agricultural produce, the efficacy of various materials in feeding animals, and the general relations between the composition of the crops obtained and the manure used in the ordinary routine of practice in his locality, —had led him to adopt the conclusions, that the carbon and nitrogen obtained in the several crops comprised in a rotation amounted to much more than was contained in the manure supplied within the same time ; and consequently that these constitutents must be derived in some way from the atmosphere during vegetation ; that those alternations of crops which admitted of accumulations of carbon and nitrogen being gathered from the atmosphere, and conserved upon the farm most largely, in the form of manure, were the most advantageous ; that certain plants were better fitted for this purpose than others ; and that the value of manure was, to a great extent, indicated by the amount of ammonia or nitrogen which it contained.

Ingenhousz and Saussure had already adopted the opinion that the carbon of plants was, to a great extent, derived from the air, and the same view had been put forward by Brongniart, in reference to the origin of the coal strata, as more probable than the humus theory. But it was not until the year 1840 that a comprehensive theory of plant-nutrition was propounded, by Liebig, with such perspicuity and force as to excite universal attention. The fundamental proposition of that theory was, that the food of plants, the materials from which the chief mass of their substance is produced in vegetation, consists solely of carbonic acid, water and ammonia. The chemical arguments by which this view was supported, in opposition to the prevailing opinion that plants derived their carbon, hydrogen, oxygen and nitrogen from humus and from other vegetable and animal substances, were conducted in such a convincing and logical manner, that Liebig has been generally regarded as being entitled to the same honor in the establishment of this theory of plant-nutrition, as if the data on which it was based had altogether originated with himself. Liebig's researches on the phenomena of the decay of animal and vegetable materials afforded, together with the existing knowledge of the phenomena

of animal life, the most conclusive evidence that the ultimate products of those processes were carbonic acid, water and ammonia, precisely those materials constituting the chief food of plants. Moreover, these substances cannot be combined in any way, so as not to contain a far greater amount of oxygen than the substances of which plants collectively consist, and which are produced in vegetation. This fact showed that elimination of oxygen was a necessary feature of vegetation, and threw an entirely new light upon the known constitution of the atmosphere and the decomposition of carbonic acid by growing plants; at once establishing a most remarkable relation between the phenomena of vegetation and of animal respiration, and demonstrating the essential interdependence of the processes of animal and vegetable life.

From the fact that the food of animals is provided exclusively by the vegetable kingdom, either directly, in the form of grains, roots, fruits, &c., or indirectly, through the medium of animal life, as the flesh of herbiverous animals, the importance of a knowledge of the chemistry of vegetation, in reference to the cultivation of plants as a source of food for animals, is self-evident. Consequently, Liebig's exposition of his theory of plant-nutrition had especial reference to the practice of agriculture, just as the researches of Saussure, Boussingault, Lawes and others had been prosecuted in the same direction; and it was developed, in its application, into a theory of agriculture, in his work published in 1840, entitled "Chemistry in its Applications to Agriculture and Physiology."

In order to illustrate the chemistry of manures, and the principles involved in their use, as well as in the general routine of agricultural practice, it would be necessary to give a brief statement of the general features of the chemistry of vegetation, considered from an abstract point of view, so far as the present knowledge of that subject will permit; then to describe the conditions which exercise the chief determining influence upon vegetation, in regard to the object appertaining to agriculture generally, and the different means adopted for the attainment of that object, according to the modification it receives by the various special circumstances under which the art is practised.

The ultimate result of the growth and development of plants consists in the production of a number of oxygenated and nitrogenous hydro-carbon compounds:—Starch, sugar, gum, lignin, fat, albumin, gluten, legumin, fibrin, &c., which, in some form of subordinate modification, are universal constituents of all plants;

and a great variety of other analogous substances, which are special constituents of particular plants or of particular plant organs.

The chief mass of the solid portion of plants consists of these substances; it is the main function of vegetation to produce them, and thus to provide food for animals.

These constituents of plants were formerly termed, in a chemical sense, "organic" substances, in conformity with the opinion that they could be produced only by the plant-organism, under the influence of vital action; and that they were totally distinct in their chemical nature, from the compounds producible artificially, and from those belonging to the mineral kingdom, which were termed "inorganic" to distinguish them chemically from the proximate constituents of organized bodies—either plants or animals. Modern chemistry, however, has discarded that opinion, and with it, the use of the terms organic and inorganic, as expressive of a distinction which no longer represents a recognized difference; but the term "organic" is still conveniently applied to the constituents of plants and animals without involving such a distinction.

The materials from which the proximate constituents of plants are produced in vegetation are few. According to the present state of knowledge, carbonic acid is the principal source of the carbon; but in the case of some plants, a further portion of the carbon may be derived from other carbon compounds, as humus, or ulmin. Water is the source of hydrogen and oxygen, while nitrogen is derived partly from ammonia, largely also from nitric acid; possibly to a limited extent from other combinations. The weight of evidence is greatly in favor of the opinion that free nitrogen, whether in the atmosphere or in the soil, is never directly assimilated by plants.

Among the substances above named, carbonic acid, water, ammonia and nitric acid constitute the chief materials of plant-food; and since it is from them that the organic constituents of plants are principally produced in vegetation, they have been sometimes called the "organic materials of plant-food." Under natural conditions, these substances are constantly supplied to plants by the atmosphere, which contains them in small proportion, but in large aggregate quantity, continually replenished by the respiration of animals; by the decay of dead animals and plants; by combustion; from mineral waters and fissures in the earth; by rain, dew, and the evaporation of water from the ocean, lakes and rivers. Very recent investigations indicate that much of the nitrogen taken

up by plants is rendered available to their use, by being first combined with oxygen, in the soil, in the process known as "nitrification." From whatever source they are derived their value in regard to vegetation is the same. They may, therefore, be termed collectively the air-food of plants; and the organic substances produced from them in vegetation may be designated as the air-derived constituents of plants. So far as relates to the merely abstract view of the chemistry of vegetation, it is a matter of indifference whether the materials, constituting the air-food of plants, are derived exclusively from the atmosphere, or whether they are to some extent derived from other sources also, and indirectly, as for instance, by the decay of animal and vegetable substances contained in the soil, or supplied to it as manure. The case is very different, however, when vegetation is viewed from a practical point of view, and when the objects and circumstances of the practice of agriculture have to be included in the consideration of the subject, the difference is of the highest importance.

But there are also other materials concerned in vegetation besides the carbonic acid, water, ammonia, &c., from which the plant constructs its chief substance. In almost all plants, and in every organ of a plant there are certain substances—indestructible by fire—which remain as ashes when plants are perfectly burnt.

The ash of all plants contains potash, soda, lime, magnesia, phosphoric acid, sulphuric acid, silica, iron, &c., which, in the case of land-plants, are derived exclusively from the soil in which the plants grow.

The relative proportions of these substances vary considerably in different plants, and in the different organs of the same plant; sometimes also, though in a less degree, according to the character of the soil on which the plant grows; but most of them are, in greater or less amount, constant constituents of plants, and are therefore to be regarded as necessary to their existence and essential to vegetation.

In connection with the chemistry of agriculture, these substances have been commonly called the "mineral" or the "inorganic" constituents of plants; mineral, in accordance with the recognized classification of natural objects, into mineral, vegetable and animal, because they are earthy in their nature, and are likewise derived from the earth; inorganic, to distinguish them from the organic constituents of plants which are produced in vegetation from carbonic acid, water, ammonia, etc.

The condition in which the above substances are found in the ashes of plants, is doubtless very different from that in which they exist in the plants themselves, and very little is known as to what that may be. The functions they perform in vegetation are also little understood. The amount of them contained in plants is comparatively very small; but those which are constant and essential constituents of particular plants being necessary to vegetation, must be regarded as indispensible constituents of plant-food. This is evident from the fact that plants will not grow to maturity under conditions which exclude a supply of the ash-constituents found in them under ordinary circumstances. The necessity of the ash-constituents in vegetation is rendered still further apparent by the fact that the fluids and organs of animals—their flesh, blood, bile, chyle, gastric juice, bones and tissues—contain precisely those ash-constituents which are always found in fully developed plants.

Moreover, the functions of these ash-constituents in the process of animal life have been so far traced, that there cannot be any doubt of their being essential to it, both in the growth of animals—when they partly remain in the body, contributing to its increase—and during the life of mature animals when they no longer remain and accumulate in the body, but are eliminated, either directly or indirectly in common with the rest of the daily food, in the excretions, after having performed their part in the chemical process of animal life.

The ash-constituents of plants have, therefore, a two-fold importance, being essentially concerned both in vegetation and in animal life. Since they cannot be derived from the atmosphere, it is evident that the soil on which plants grow has a far more important share in vegetation than that of affording merely mechanical support; that it is likewise the source of an essential portion of their food.

The mode in which the materials of plant food are taken up into the organism of the plant is twofold; partly by means of the leaves, and partly by the roots. The absorption of carbonic acid by the leaves and green parts of plants, first observed by Priestly, and more fully demonstrated by Saussure and Sennebier, is one means by which plants may appropriate carbon, and perhaps water, but that they obtain nitrogen in the same way has not been proved. The ash-constituents of plants can be introduced into their organism only by the roots, and the structure of plants justifies the

opinion that they are chiefly taken up in the state of solution in water. But, besides the ash-constituents, other food-materials are also taken up by the roots, especially in cultivated plants—carbonic acid, ammonia or other nitrogenous substances, and perhaps also carbonaceous compounds other than carbonic acid.

Scarcely anything is known as to the precise influence exercised upon the growth and development of plants by the relative amounts of air-food supplied by the atmosphere and from within the soil, or of the modification of growth which may result from such influences; though there are numerous facts, established by agricultural experience, which apparently indicate that this circumstance is, in some cases, of special importance in determining the character of the produce.

Nor are the special functions of particular materials of plant-food in the growth of plants any better understood, though experience appears to indicate that they are useful in some other way than by directly contributing to the increase of the mass in the plant; and it is far from being established that either the kind or amount of the substances of which plants consist afford a quantitative indication of the food-materials which are necessary in their growth. This is especially the case with cultivated plants which are frequently grown with special objects, requiring a disproportionate development of particular organs and constituents.

These circumstances render it very doubtful whether the requirements of plants during their growth, can be correctly measured by a knowledge of their composition alone, any more than it would be possible, in the case of animals, to determine the quantities of food required during their existence, merely from a knowledge of the qualitative and quantitative composition of the animal at any period of its life.

The various materials concerned in vegetation as plant-food, are all equally necessary for the growth and development of the great majority of plants. No one of them can be replaced by anything else, not even by an increased amount of some other of them. All must be supplied together; in the absence of any one, the rest, however abundant, are wholly incapable of supporting vegetation, and deficiency of any one limits the effect of the remainder.

However, the relative proportions of the several materials of plant-food requisite for vegetation, are not absolutely constant for all plants; on the contrary, they vary to some extent for different plants, or families of plants; some plants drawing more largely

upon the air-food than others; some requiring a greater proportion of ash-constituents. Among the former, some produce the nitrogenous constituents in larger proportion than others; while some produce chiefly the carbo-hydrates, as starch, sugar, lignin, &c. Among the latter, some require alkalies, some phosphoric acid in preponderating amount, others require chiefly lime, silica, &c.

The special conditions under which plants grow also exercise a considerable influence in modifying their requirements as regards the several food-materials, and in determining the size of particular organs, as well as the relative proportion of the nitrogenous and non-nitrogenous constituents produced; as for instance, the varying proportions of starch and of gluten in wheat grown in unlike situations. Many plants become, under cultivation, widely different, both in structure and composition, from what they are in their natural state; but the extent to which this influence is, or may be exerted, is far from being sufficiently ascertained. Climate and season, the mechanical condition of the soil, the greater or less facility with which some or all of the food-materials may be obtainable by plants in particular cases, and the plentiful or scanty supply of certain food-materials, are all doubtless influential in this respect, and this subject still offers a wide field for observation and research.

Among those conditions of vegetation which are neither chemical nor climatic, the physical character and state of the soil exercise great influence upon the amount of produce. Soils differ naturally, in this respect, according to the relative proportions of clay, sand, gravel, &c., which they contain, and they differ, perhaps still more widely, in regard to the texture they possess or are capable of acquiring by tillage.

The essentially chemical conditions of vegetation consist, then, in a supply of food-materials: they comprise the existence in the soil of the requisite ash-constituents in a state fit for assimilation by plants, and a supply of the requisite air-food. Wherever these conditions obtain in due proportion, together with the conditions of climate, &c., required by particular plants, whether perennial or annual, those plants will grow, attain maturity and perfect development.

So far then as relates to the purely chemical conditions of vegetation, other conditions being the same, the quantity of plant-substance produced within a given time on a given area of land—that is to say, the amount of produce—will be determined, within cer-

tain limits, by the quantity of plant-food supplied; and it will be limited by the available quantity of that constituent of the food which is supplied, meanwhile, in least amount, relatively to the general requirements of the particular plant growing.

Since the very striking differences recognizable in vegetation at different places, or on different land, and manifested in the unequal amount of produce, cannot be ascribed to the atmospheric supply of air-food, which is always constant, and everywhere the same, it becomes necessary to seek in the soil for the chemical cause of these differences in the degree of fertility as represented by the amount of produce. The soil being the only source of the ash-constituents of plant-food, the capability of performing its share in the chemical conditions of vegetation must necessarily depend upon its containing the requisite ash-constituents, in sufficient amount, and in such a state, as to be available in the growth of plants.

When it is considered that soils have been formed by the mechanical and chemical alteration of rocks possessing the most varied composition, that they consist of the disintegrated debris of granite, schists, clay-slate, limestone, sandstone, &c., it is evident that their chemical constituents must vary greatly according to the particular rocks from which they have originated, just in the same manner as they differ in being sandy, loamy or clayey.

The total amount of the ash-constituents concerned in vegetation will therefore be very different in different soils. Moreover, the different chemical nature of the minerals constituting the rocks from which soils have originated, and the unequal susceptibility of those minerals to decomposition under atmospheric influences, give rise to wide differences between soils in regard to the chemical condition of the ash-constituents they contain. Both these circumstances may influence the fertility of land.

The mechanical operations of tillage, besides communicating to soils that texture which is necessary to admit of the free development of the roots, are also conducive to the chemical alteration of minerals in the land by facilitating the access of atmospheric air, and the consequent decomposition of insoluble alkaline silicates and phosphates. The fertilizing influence of tillage* upon land, especially when it contains a large proportion of clay, has been

* For more extended remarks on this important consideration, see page 72 et seq. of the Report for 1861, "Cultivation a Fertilizing Agency."

long known, and it was at one time, by Jethro Tull and his followers, believed to be a substitute for manuring.

The analysis of soils, from which so much advantage was at one time anticipated, has not been found so useful as had been supposed in regard to agriculture, or, indeed, capable of affording any such trustworthy evidence as to the composition of soils, or their defects, as to warrant special applications, the need of which, to enable the soil to produce certain crops, rests solely upon the indications of analysis. The following statement of the most prominent features of a number of analyses of soils, made by several chemists under the direction of Magnus, will serve to give some idea of the variation affecting the most important ash-constituents, phosphoric acid, potash, &c., existing in such states as to be partly soluble and partly insoluble in dilute hydrochloric acid. The large gross amounts connected with the small percentage of those constituents also give the clue to the cause of the failure of soil analysis to serve the uses which were expected from it.

	Percentage amount of ash-constituents in soils.					Quantity per acre at a depth of one foot soluble in acid.
	Soluble in dilute acid.			Insoluble in acid.		
Average.	Average.	Maximum.	Minimum.	Maximum.	Minimum.	Average, lbs.
Lime,	0.895	–	–	–	–	35,794
Magnesia,	0.260	–	–	–	–	10,180
Potash,	0.221	0.530	trace.	3.406	trace.	8,983
Soda,	0.161	–	–	–	–	–
Silica,	0.448	–	–	–	–	17,920
Phosphoric acid,	0.172	0.651	trace.	–	–	7,581
Sulphuric acid,	0.154	–	–	–	–	–

The extent of the resources of land in ash-constituents is still farther illustrated by the following table calculated from the experiments conducted by Lawes and Gilbert, at Rothamstead, England, in which wheat was grown every year on the same land without any manure for twenty years. The land was "what may be called fair average wheat land." "The soil a somewhat heavy loam, with a subsoil of raw yellowish red clay, but resting in its turn upon chalk, which provides good natural drainage."

The average amount of produce in the neighborhood at the time when the experiments were commenced, was under twenty-two bushels per acre, and wheat was grown only once in five years. When the experiments were commenced in 1843, the land was in

such a condition that, according to the ordinary routine, it required to be again manured with farm-yard manure; for since the previous application of manure, four crops had been removed from it, viz., barley, peas, wheat, oats.

Ash-constituents removed from land by wheat.

	In 20 consecutive years.			In average annual crop.		
	Total produce, lbs.	Grain, lbs.	Straw, lbs.	Total produce, lbs.	Grain, lbs.	Straw, lbs.
Total ash-constituents,	2,241.00	354.00	1,887.00	112.00	18.00	94.00
Silica, ...	1,299.77	3.54	1,226.23	61.48	0.18	61.30
Phosphoric acid, . .	252.56	177.10	75.46	12.62	8.85	3.77
Potash, . . .	360.94	106.26	254.68	18.04	5.31	12.73
Soda, ...	9.43	–	9.43	0.47	–	0.47
Lime, ...	105.49	11.16	94.33	5.28	0.56	4.72
Magnesia, . . .	77.40	39.67	37.73	3.87	1.98	1.89
Sulphuric acid, . .	51.88	–	51.88	2.59	–	2.59
Chlorine, . . .	37.73	–	37.73	1.89	–	1.89

The soils in which the fertilizing effects of tillage are most marked, are generally of a clayey nature, and are therefore capable of furnishing a larger supply of ash-constituents under the influence of weathering or atmospheric decomposition.

There is also another characteristic which such soils possess in a high degree, viz., the capability of absorbing ammonia from the atmosphere. By reason of this capability they store up, during the period of fallow, the ammonia conveyed to them from the atmosphere by rain and otherwise, and thus provide an increased supply of this air-food to plants requiring it.

The absorptive power of soils is not limited to ammonia, but extends likewise to most of the important ash-constituents of plant-food which are soluble in water. This fact was first observed by Thompson, and was afterwards investigated by Way. It is highly probable that the condition in which substances are thus retained by soils, so as to be gradually supplied to the roots of plants by the medium of carbonic acid and water, is of great importance in regard to the nutrition of plants, and to the relative fertility of land.

In considering the chemical conditions which determine the relative fertility of land, we will examine, in the first place, how far this is determined by the ash-constituents. So far as these alone are concerned, the degree of fertility would be in a strictly chemical sense, proportionate to the available amount of ash-constituents it was capable of furnishing within the period of growth; but the

amount of produce would not vary in the same ratio, because the ash-constituents of land cannot be useful in vegetation except in so far as they can coöperate with a due proportion of air-food.

If the sources of air-food, available during the period of growth, were limited to the constant atmospheric supply, the amount of produce would be proportionate to the capability of assimilation by the plant, under the other prevailing conditions of climate, season, &c.

But if other sources of air-food were available within the period of growth, in addition to the atmospheric supply, and together with an abundant supply of ash-constituents by the land, the amount of produce would be largely augmented under conditions otherwise the same. Thus plants growing upon land affording only a scanty supply of available ash-constituents might be, on that account, incapable of assimilating air-food to the full extent of the atmospheric supply, and the amount of produce in such case would be small. By the death and decay of these plants, their ash-constituents would be restored to the land, so as to become capable of serving for a succeeding growth of plants and the production of humus, at the same time would provide in the soil itself a further source of air-food in addition to the atmospheric supply. Still the amount of produce from the succeeding growth would be small, if the available supply of ash-constituents remained scanty as before. In this way vegetation might continue indefinitely without much alteration, affording sustenance to numerous animals, as on the steppes of Central Asia and the prairies and pampas of America.

But if a larger amount of ash-constituents became available, in the interval between the successive growth, by the decomposition of minerals in the land, the conditions might become such as to ensure assimilation of air-food not only to the full extent of the atmospheric supply during the period of growth, but also from the further supply provided by the gradual decomposition of humus in the soil; and in such case the amount of produce would be proportionally increased.

The greater or less amount of available ash-constituents is, therefore, not the only condition upon which the amount of produce or the fertility of land depends, even in a strictly chemical sense; another essential condition is the amount of air-food capable of being supplied from within the soil during the period of growth. Land however rich in available ash-constituents, would

still afford but scanty produce without an ample supply of air-food during the period of growth. The increased supply of air-food yielded by the decomposition of humus in the soil may be regarded, in this respect, as the accumulated atmospheric supply of several successive growths; and the capability of land to furnish such a supply is, in a chemical sense, as much an element of its fertility, as the available amount of ash-constituents it contains.

The requirements of different plants for such an augmented supply of air-food, in regard to the amount of produce, differ very widely, and the capability of different plants to assimilate the air-food thus stored up is also very different. The adaptation of the capability of one plant, in this respect, to provide for the requirements of another, and the development with that view of particular habits and conditions of growth in regard to certain crops, constitute the basis of the modern system of agriculture.

Having thus far treated of the general features of the chemistry of vegetation, in its simplest form, they will now be considered in their relation to agriculture; and it will be desirable first to examine the conditions affecting the supply of ash-constituents, as well as their influence under different circumstances.

In the cultivation of plants as a source of food for animals and for other purposes, the ash-constituents requisite for vegetation are removed from the land in the produce; and since they are not replaced in the same manner as the atmospheric supply of air-food, the successive growth of a particular plant, year after year, would in process of time, go far to exhaust the land of available ash-constituents, as to render it incapable of supporting further growth, or of yielding such an amount of produce as would be worth the trouble and cost of cultivation. Hence the practice, adopted even in the rudest state of agriculture, of applying to land the excreta of animals fed upon its produce and the decaying refuse of the plants grown upon it. Such a system would be sufficient to prevent any decrease in the annual produce of the land, inasmuch as the materials applied to it as manure, would restore whatever has been removed in the plants serving as food for animals or for other purposes, and thus render the land capable of continuing—with the aid of the atmospheric sources of plant-food—to support vegetation.

If there were absolutely no export of produce, the restoration of the ash-constituents, in such a case, would be complete, and the capability of production would continue undiminished, so far as re-

lates to the ash-constituents only. It would, in fact, increase year by year, for the available amount of ash-constituents would be gradually increased by tillage and by the consequent decomposition of minerals in the land. The improvement of land by tillage, is doubtless due, in some degree, to such an unlocking of its natural resources, and the increase of what may be regarded as its floating capital in ash-constituents.

Where the population of a country is small and thinly distributed, and where land is of small value, all requirements may be fulfilled by such a system of relying upon the natural produce, without the need of any effort to increase it. Where, on the contrary, the population was chiefly gathered in centres, and a portion of the grain was annually removed from the land for the supply of food to towns at a distance, and the corresponding excreta was not returned to the land as manure, the soil would be gradually deprived of ash-constituents in a degree proportionate to the export of food. The internal economy of the farm would then no longer ensure the full restoration to the land of all the ash-constituents of its produce. On the contrary, as the yearly export continued, and the abstraction of ash-constituents progressed, the quantitative relation between them and the atmospheric conditions of vegetation at any place would be progressively changed, for while the atmospheric supply of air food remained constant, the quantity of ash-constituents in the soil would diminish from year to year, until, eventually, vegetation might be no longer possible, in consequence of the deficiency of one of its essential conditions. Even before that time, a point would be reached when the amount of produce would be no longer limited by the supply of air-food available from the atmosphere within the period of growth; when, on the contrary, the assimilation of air-food would be limited by the available amount of ash-constituents in the land, and when the amount of produce would be so small as not to be worth cultivation.

This exhaustion of land, or reduction of the degree of fertility, would take place earlier or later, according to the nature of the land and its extent of natural resources; sooner in light, sandy soils than in loamy or clayey ones. It might be retarded by allowing it to remain at intervals without growing a crop on it for one or more years, a practice, to some extent, adopted under the name of bare-fallow. During the interval of rest, a fresh supply of available ash-constituents would be provided by the decomposition

of minerals in the land, thus compensating, in some degree, for the abstraction resulting from export of produce.

The same result may be attained by a rotation of crops, or the alternate growth of different plants requiring different ash-constituents—as grain, grass, potatoes, &c. If the grass and roots are consumed on the farm in feeding cattle they will contribute manure in return, and even if some of the cattle be exported, the greater part of the ash-constituents of the crops on which they have been fed would remain on the farm and be returned to the land in the manure.

It has long come to be regarded as an established fact that *the export of grain or hay from a country, unless some articles capable of becoming manure are introduced in compensation, must ultimately tend to exhaust its soil.*

For the successful practice of agriculture therefore, it is as necessary to maintain fertility, as it is to obtain a sufficient amount of produce. An idea may be formed of the extent of the exhaustion of land from which grain is exported by assuming that, in the countries which are the chief sources of grain, the average produce is at the rate of fifteen bushels per acre and that a grain crop is grown every other year. The quantity of ash-constituents removed from the land per acre in the crop would be about as shown in the following table:

Ash-Constituents of Wheat, Barley, Oats.

		Total produce.	Grain.	Straw.
Amount of produce per acre,		2,260 lbs.	15 bush.	1,333 lbs.
Total Ash-Constituents,		92 "	15 lbs.	77 "
Comprising	Phosphoric acid,	11 "	8 "	3 "
	Potash,	14 "	4 "	10 "
	Lime and Magnesia,	8 "	2 "	6 "
	Silica,	51 "	0 "	51 "

The greater part of these being contained in the straw, would be returned to the land in the farm-yard manure; and if the whole of the grain were exported, without any supply of ash-constituents from without, there would be a permanent abstraction of them at the rate of four pounds of phosphoric acid and two pounds of potash annually per acre. These being the substances which are least abundant in land it is the more necessary that they should be restored again in some way.

But in order merely to maintain the degree of fertility, the supply from without does not require to be equal to the quantity removed,

for land always possesses, in addition to its immediately available resources in ash-constituents, other resources which are latent, but from which fresh supplies are gradually developed, and rendered available by the operations of tillage as already described.

The fertilizing influence of manure is not, however, limited to the restoration of ash-constituents to land. It is also due to its capability of furnishing a larger supply of air-food to future crops, during their period of growth, than they could obtain directly from the atmosphere. This is one of the chief advantages resulting from rotation and the growth of fallow crops for feeding cattle. The advantage of bare-fallow is also, to some extent, due to the accumulation of air-food in the soil, in virtue of its absorptive power.

Since the available ash-constituents of land can be effective in inducing an increased amount of produce, only in so far as they can coöperate with a proportionate supply of air-food, it is evident that the supply of the latter, by manure, must be of special importance when it is desired to obtain a large amount of produce.

If we except phosphoric acid, and perhaps potash also, the resources of the generality of land in ash-constituents preponderate so largely over the air-food available from the atmosphere, within the period of growth of ordinary crops, and the latent resources of the land so steadily furnish fresh supplies of ash-constituents, by the operations of tillage, that under good farming the probability is rather in favor of the ash-constituents available at any particular time (with the exceptions above named) being in excess of the supply of air-food directly available from atmospheric sources within the period of growth, and of that provided by the home-made manure.

In some cases the gradual unlocking of the latent resources of the soil by tillage may considerably exceed the yearly abstraction of ash-constituents. This condition of fertility may increase from year to year, so that instead of retaining a portion of the air-food from the atmosphere and from manure, the latter may become relatively very deficient. The extent to which the accumulation of available ash-constituents in relative excess may take place, is well illustrated by the experiments made at Rothamstead, on the growth of wheat, upon land which had been so reduced, in the ordinary routine, as to yield only about half its former average produce. By the use of manure containing only the ash-constituents of wheat, on this land, the amount of produce in 1844 was

not greater than on the same land unmanured. In the following year, the application of 336 lbs. of ammoniacal salts was attended with an increased amount of produce amounting to double that obtained the previous year. By continuing to grow wheat upon this land for nineteen consecutive years, with ammonia salts only as manure meanwhile, the amount of produce obtained in each year continued to exceed that from the unmanured land; the average increase for the whole term from 1845 to 1863 being upwards of fifty per cent., notwithstanding the very exceptional and continued drain on the ash-constituents of the land.

		Amount of produce per acre.				Ash in produce per acre.		
		Wheat. bush.	Wheat. lbs.	Straw. lbs.	Total. lbs.	Wheat. lbs.	Straw. lbs.	Total. lbs.
Average of 19 yrs., 1845-63.	Unmanured,	16½	1,031	1,723	2,754	18	96	114
	Ammonia Salts,	24½	1,575	2,737	4,312	25	128	153
Total in 19 yrs., 1845-63.	Unmanured,	310	19,597	32,740	52,337	338	1,824	2,162
	Ammonia Salts,	464½	29,932	52,008	81,940	465	2,440	2,905

These results prove that the available amount of ash-constituents in the unmanured land was far in excess of the other chemical conditions of fertility, viz., the amount of air-food supplied by the atmosphere and by the soil during the period of growth. The exhaustion consisted in the relative deficiency of air-food capable of being supplied from within the soil; and therefore increase of produce could only be effected by an artificial supply of air-food.

On the other hand, it is equally true that in cases where air-food is applied to soils in excessive amount, relatively to the available quantity of ash-constituents in the soil, the latter may be so far exhausted by several successive crops, that the amount of produce which the land is capable of yielding will be less than would be grown upon similar land from which similar crops (in kind, not in amount) had been grown during the same years without the addition of any manure whatever.

Whether there have been any series of carefully conducted experiments, protracted over a term of years, showing this result with precision and exactness, I am not advised; but there are not a few instances along the coast of Maine where this practice has been adopted, and with unmistakable results. Fish refuse, or "porgie chum," as it is commonly called, contains largely of albumin, fibrin and other nitrogenous constituents usually occurring in animal substances, and which are capable of yielding ammonia in

abundance during their decomposition in the soil. If applied before decomposition has liberated and given off its ammonia, it constitutes the most available resource for air-food possessed by the farmers of the coast. The cheapness and abundance with which this has been obtainable at various points where the porgie fishery is prosecuted, its evident activity and efficacy in the production of heavy crops when first applied to the generality of soils, have led some to use it with such lavish profusion as to enable the crops grown in a few years to appropriate all the available ash-constituents contained in the soil. The exhaustion following such procedure and the necessary failure of crops continues until applications are made to the land of some substances containing the requisite ash-constituents; or, until by the operations of tillage, bare-fallow, or the weathering and consequent decomposition which accompanies merely letting it alone, additional supplies of ash-constituents are rendered available from the latent resources of the soil.

The practice of agriculture in many localities does not require that the amount of produce obtained should be very large, the only thing necessary being to maintain the natural degree of fertility, as in those countries which produce most largely of grain. In such cases the manure produced upon the farm, if properly husbanded and suitably applied, may supply all the plant-food required, both of air-food and ash-constituents. But where population is dense, and land is of high value, agriculture assumes a quite different character. Its object then is not merely to maintain the natural degree of fertility, but to produce year by year, in the most profitable manner, and on a given area of land, the largest possible quantity of food for man and beast. Hence arose the idea of employing artificial manures,—of augmenting artificially the chemical conditions of fertility. The problem in this case, to be solved by the chemist for the guidance of the farmer is, what substances to supply as plant-food from extraneous sources, in order to obtain, year after year, a remunerative produce?

The question is mainly one as to manure: its solution, however, involves the consideration of conditions and requirements other than those which obtain in natural vegetation, not differing in kind, but quantitatively different. Still the knowledge of the general phenomena of plant-nutrition must be the guide in the endeavor to solve this problem. Since it is established that the various materials of plant-food must bear a certain proportion to each

other in order to be in the highest degree effective, and since the amount of produce is known to be limited by the quantity of that food-material which is present in least available amount, relatively to the requirements of any particular crop, the desideratum, in regard to the artificial means of increasing the amount of produce, is to ascertain what food-material becomes deficient, relatively to the others, under the circumstances attending the growth of that crop. The deficiency may lie in the source of nitrogen, in the supply of water, or of available ash-constituents or of some one of the latter; but whichever it be, the amount of produce will be limited by the deficiency.

The determination of that point will indicate, therefore, what food-material it is most necessary to supply artificially, in order to render most effective those food-materials which are available in greatest abundance, relatively to the requirements of the crop in question. The food-materials least available abundantly in the same relation would be, in that particular case, the manure to be supplied artificially in order to obtain an increased produce.

Of course, all which can be attempted here is to state the case as clearly and distinctly as practicable. A definite answer in each particular case is a problem of itself, and until chemistry has made vastly greater advances than it has yet done, the practical farmer must rely chiefly upon his best judgment, enlightened by all the scientific aids within his reach, and exercising the most critical observation in his power.

We may, however, do well to consider some of the applications which have been made of the general knowledge of the chemistry of vegetation, or of the views which have been entertained with regard to it.

Liebig, in applying to agriculture the theory of plant nutrition which he constructed from the materials furnished by Saussure, Davy, Sprengel and Boussingault, adopted the fundamental proposition, that plant-food consists solely of carbonic acid, water, ammonia and the ash-constituents. In endeavoring to ascertain the causes of the efficacy of manure; the mode in which it acts; the circumstances upon which the different methods of culture depend; and to establish rules for a rational system of agriculture, he addressed himself first to the questions, "What does the soil contain? What do the materials called manure contain?" as questions whose determination constituted the starting point of rational agriculture. In this inquiry his attention was mainly directed to the ash-constitu-

ents of plants, and to the comparison of these with the constituents of soils and of manure. Observing that all cultivated plants contained potash, phosphoric acid and other ash-constituents; that the presence of these substances was constant in particular plants, and parts of plants; that every productive soil contained the same substances; that the repeated successive growth of a particular crop on the same land rendered it less capable of producing that crop until an interval of some years had been allowed to elapse without growing it,—he came to the conclusion that the capability of land to produce crops was due to the presence in it of the ash-constituents of plants; that the assimilation of carbon and nitrogen was dependent upon the presence of the ash-constituents in the soil, and limited by the available amount of them; consequently, that the amount of produce was proportionate to the available amount of ash-constituents in the soil. From the same data he concluded that the decrease of produce observed when a particular crop is raised year after year on the same land, was due to the abstraction of ash-constituents from the soil.

Observing, further, that animal excreta and the plant remains in farm-yard manure contained the same ash-constituents as the plants which had been consumed as food; that this manure exercised a fertilizing influence upon land naturally unproductive, or exhausted by the cultivation of crops,—he concluded that the efficacy of this manure which might be regarded as the ashes of the food burnt in the bodies of animals, was due to the ash-constituents it contained, that its peculiar action consisted in and was limited to the supply or restoration of the ash-constituents, which the land was either destitute of or had been deprived of by previous crops.*

From the well known facts that the produce of land could be increased by manure, and that in many cases the crop is directly proportionate to the quantity of manure used, he concluded that this effect was referable to the amount of ash-constituents supplied to the land; that if the supply of those constituents was greater than the quantity taken away in the previous crop, the amount of produce would be increased; that if the supply of them was less than that, the produce would be reduced, and that if it was just equal to the quantity removed, the produce would remain constant.

Adopting these conclusions as axioms to be observed in practical

* Address to the Agriculturists of Great Britain.

agriculture, Liebig also taught that the production of the organic constituents of plants from carbonic acid, water and ammonia, was determined by the presence of the ash-constituents proper to the plants cultivated; that its extent was limited by the available amount of them in the soil; that the amount of produce was so entirely independent of the artificial supply of ammonia, that if only the ashes of solid and liquid excreta were supplied as manure, the crops cultivated would derive their carbon and nitrogen from the atmosphere; that the ammonia of the atmosphere, exceeding the requirements of wild plants, was fully sufficient for all the objects of agriculture.

The production of the nitrogenous constituents of plants which constitute the food for man and animals, was represented by Liebig as depending on the presence in the soil, of phosphates, which enabled plants to derive the requisite nitrogen from the atmosphere. He also insisted that it was of the greatest importance for agriculture to know with certainty that the artificial supply of ammonia was unnecessary and superfluous for the growth of most cultivated plants, and that the value of manure could not be estimated, according to the rule recognized in France and Germany, by the amount of nitrogenous substances it contained. To give force to his opinions he instanced the large quantity of nitrogenous substances produced—as hay, milk and flesh—on grass land which had received no nitrogenous manure. He referred to the export from Egypt of ammonia obtained by burning animal excreta; to the proverbial fertility of that country where Nile mud had been the cheap fertilizer for ages; to the export of cheese from Holland and Switzerland, as proving conclusively that the production of nitrogenous constituents of plants was not proportionate to the quantity of nitrogen supplied to the land in the manure.

The logical consequence of the opinions thus formed, was to regard the ash-constituents as the essentially, if not the only, effective portion of the manure. It was insisted upon as a point of great importance for the practical farmer not to deceive himself concerning the cause of the efficacy of manures. In this respect, he compared the ash-constituents to the quinine of Peruvian bark, the iodine of burnt sponge or the active principles of opium. Consequently, the ash-constituents of manure were the materials which, according to his view, it was essential for the farmer to supply to the land artificially, in order to increase the amount of produce.

The fundamental principle of rational culture, according to that

view, was the perfect restoration of the ash-constituents removed from the land; and whether that restitution was made by applying excreta, or ashes, or bones, was regarded as a matter of indifference. The particular kind of ash-constituents to be used as manure, was to depend upon the kind of produce required; alkalies for the production of substances analogous to starch; phosphates for the production of nitrogenous substances. By ascertaining the amount of ash in cultivated plants and by the analysis of the ashes, the quantities of these substances removed from the land by crops was to be ascertained. Thus the farmer was to be enabled to keep a debt and credit account for each of his fields of the several ash-constituents removed from the land, year by year, and to determine, according to the kind and quantity of the crops grown upon it, what substances and what quantities of them were to be returned to the land, in order to restore its original condition of fertility, and how many pounds of one or other constituents was to be supplied to the land in order to increase the amount of produce.

This theory of the chemistry of agriculture was applied by Liebig in the production of artificial manure; and a patent was obtained for the method of manufacture. These artificial manures were intended to supply to the land exactly what was wanting for the growth of any particular crop, and thus to effect an economy which would be impossible while manure was applied indiscriminately—the useful and the unnecessary constituents together. But the chief advantages which these artificial manures were to secure, were to render the rotation of crops and fallowing unnecessary and superfluous, and to admit of one and the same kind of crop being grown year after year upon the same field—for instance, of a perennial wheat crop without the necessity either of fallow or rotation of crops, which was regarded by Liebig as a restriction excluding all that science might be able to teach.

These manures, which were intended to effect such an entire revolution in agricultural practice, consisted chiefly of compounds of carbonates of potash and lime, silicates of potash, gypsum, phosphate of lime and salt, with less than half of one per cent. of ammonia. The following table contains analyses of these manures as manufactured by Messrs. Pfeiffer, Schwarzenberg & Co., in Cassel. For the sake of comparison, the calculated composition of the several manures, according to the directions of the specifications of the patent, is also added:

Composition of Liebig's Artificial Manures.

		For cereals.		For leguminous crops.		For root crops.	
			Calculated.		Calculated.		Calculated.
Soluble in Hydrochloric acid	Ammonia,	–	0.28	–	0.24	–	0.40
	Potash,	9.30	40.32	11.38	26.28	14.60	19.10
	Soda,	10.00	4.72	13.70	13.20	4.02	15.73
	Lime,	21.20	9.16	25.23	16.20	32.20	20.05
	Magnesia,	3.75	0.64	1.67	0.64	1.55	1.06
	Oxide of Iron,	5.05	–	1.48	–	1.36	–
	Phosphoric acid,	5.50	6.00	1.50	9.76	2.37	14.20
	Sulphuric acid,	10.08	3.72	9.17	3.72	6.70	3.06
	Chlorine,	1.04	–	1.16	2.40	1.68	–
	Carbonic acid,	9.82	7.56	14.33	16.48	25.20	21.60
Insoluble in Hydrochloric acid,		24.30	–	18.39	–	9.08	–
Silica,		–	26.00	–	8.32	–	–
Water,		–	3.00	–	2.96	–	4.50
		100.4	100.00	98.01	100.00	98.76	100.00

The proper composition of manures for other plants was to be ascertained by burning the plants and analyzing the ashes, and then combining the manure according to the analysis.

In his *Address to Agriculturists*, explaining the principles of artificial manuring, Liebig stated his view that "the exhaustion of the soil by subsequent crops—its decrease in fertility—is produced by the gradual removal of the mineral elements, in a soluble state, which are necessary for the development of our cultivated plants. By a supply of manure they are again restored to the state suited to serve as nourishment to a new vegetation. If the supply of the removed elements of the soil by means of manure be sufficient—if the quantity taken away be restored, the original fertility reappears; if the supply be greater, the produce increases; a defective supply gives a smaller produce;" or, in other words, the amount of produce was directly proportionate to the available quantity of ash-constituents, or mineral substances which "as such are indestructible by fire, and consequently remain as ashes after the incineration of the plants, or of their parts."

Consequently, the agriculturist was to confine himself to supplying these substances to his land, and giving it the proper physical condition, so as to render possible, and to increase, the assimilation of carbonic acid and ammonia from the atmosphere.

This theory of agriculture, or of manures—known as the mineral theory—was received with much enthusiasm in England and America, and the estimation in which it was then held is fairly represented by the following comments, published shortly after the introduction of the new manures:

"Since the organic food-materials are universally supplied to plants in constant amount, the great difference of vegetation cannot be sought in them, and consequently must be due to the inorganic constituents; so that, in putting farm manure upon land, it would be essentially quite the same if it were first burnt, and only the ashes strewed upon the land, since its efficacy can only be due to its ash-constituents. It is easy to perceive that this principle, applied to agriculture, suddenly sheds a new light upon all phenomena whose explanation has hitherto been sought for in vain. Now, it is easy to conceive why irrigated meadows can yield annually great quantities of hay without manure when the necessary quantities of salts are conveyed to it in the water. It becomes clear how the Peruvian is able to obtain luxuriant crops of maize upon arid sand-drifts, if only a tiny rill from the snow peaks of the Andes conveys to them the requisite soluble earths. Hundreds of similar phenomena are elucidated by this ingenious idea of Liebig's; but hundreds of new ideas are also suggested fruitful in development and improvement for that simplification and security of agriculture which will be the inheritance of posterity; and we begin to find it natural that in England, where, according to the standard hitherto known, agriculture stands so high, Liebig should be celebrated as the founder of a rational system, in opposition to the previous purely empirical one; and that he should be overwhelmed with laudatory demonstrations and marks of honor in such a way as scarcely any one, and certainly no foreigner, has ever experienced there."

Elaborate investigations of plant-ashes were undertaken by Profs. Way and Ogston under the auspices of the Royal Agricultural Society of England,* with the view of obtaining data for the preparation of artificial manures according to Liebig's mineral theory of agriculture.

But experience did not realize the expectations which had been entertained as to the results to be obtained by the use of manures prepared according to the principles of the "mineral theory." As might be expected, trials were made extensively, upon various soils and crops; and the result was, that while they proved beneficial when applied to turnips and clover, and to root and leguminous crops generally, there was marked failure with the grasses and cereals; thus giving evidence of the utter fallacy of the theory.

The experiments at Rothamstead were elaborate and protracted beyond parallel in the history of agricultural research. Lack of space forbids giving full reports of them here, as they occupy hun-

*For their reports see Journal Royal Agricultural Society, vols. 7, 8, 9 and 10.

dreds of pages in the Journal of the Royal Agricultural Society. What Messrs. Lawes and Gilbert remark in connection with one series, is true of all: "The records of a field of fourteen acres in which wheat has been grown without manure, and by different descriptions of manure for twenty successive seasons, without either fallow or fallow crops, and in which the lowest produce was in the first year 15, and in the last 17¼ bushels, and the highest in the first year 24¼ and in the last 56½ bushels, cannot fail to be of much interest at once to the practical farmer, to the economist, and to the man of science." A few brief extracts, however, showing the results of application of manures to wheat may serve our present purpose.

	Wheat per acre, bushels.	Weight per bushel, lbs.	Weight of grain, lbs.	Straw, lbs.	Total produce, lbs.
1843-4.					
Unmanured,	15	58.5	923	1,120	2,043
Farmyard manure, 14 tons,	20½	59.3	1,276	1,476	2,752
Ashes of ditto,	14½	58.0	888	1,104	1,992
Superphosphate,* 560 lbs.; Silicate of potash, 220 pounds,	15½	62.0	1,008	1,112	2,120
Mixed phosphates, 720 lbs.; Sulphate of Ammonia, 65 lbs.,	19	62.3	1,240	1,422	2,662
Mixed phosphates, 720 lbs.; Sulphate of Ammonia, 81 lbs.,	24⅓	61.8	1,580	1,772	3,352
1844-5.					
Unmanured,	23	56.5	1,441	2,712	4,153
Farmyard manure, 14 tons,	32	56.8	1,967	3,915	5,882
Superphosphate,* 112 lbs.; Sulphate of ammonia, 112 lbs.; rape cake, 560 lbs.,	28¾	57.8	1,871	3,644	5,515
Sulphate and muriate of ammonia, 336 lbs.,	32	56.3	1,980	4,266	6,246
1845-6.					
Unmanured,	18	63.8	1,207	1,513	2,720
Farmyard manure, 14 tons,	27	63.0	1,826	2,454	4,280
Liebig's patent manure,† 448 lbs.,	20⅓	63.7	1,400	1,676	3,076
Liebig's patent manure, 448 lbs., and ammonia salts, 224 lbs.,	29¼	63.5	1,967	2,571	4,538
Liebig's patent manure, 448 lbs., and 448 lbs. rape cake,	22¾	63.0	1,534	1,968	3,502
Liebig's patent manure, 448 lbs.; ammonia salts, 224 lbs., and rape cake, 448 lbs.,	31⅓	63.4	2,163	3,007	5,170
Sulphate of ammonia, 224 lbs.,	27½	63.6	1,850	2,244	4,094
Unmanured,	17⅔	63.8	1,216	1,455	2,671

* Superphosphate, wherever mentioned in these experiments, must be understood as trictly a mineral manure, containing no ammonia nor any other nitrogenous material whatever.

† Mr. Lawes says that the articles used were "prepared and sold under his (Liebig's) name and authority." Mr. Lawes also remarks that "the superiority which Liebig's manure, when used alone, exhibits as compared with the results of the unmanured space, may be attributed to its containing a small quantity of ammonia, which was distinctly perceptible to the smell."

A brief resumé of the aggregate results during the continuance of the experiments on wheat, so far as regards produce of grain, is embraced in the following table:

Average annual produce of wheat in bushels and pecks.

	First half of period.	Second half of period.	Total period.	Duration of total period.
Unmanured, every year, .	15.3¼	16.2½	16.1	20 yrs., 1844–63.
Ammonia salts alone, every year,	24.3¾	23.3¾	24.1¾	19 yrs., 1845–63.
14 tons farmyard manure, every yr.,	27.0½	37.3¼	32.1¾	20 yrs., 1844–63.
Unmanured, every year, .	15.1½	15.2	15.2	12 years, 1852 to 1863.
Mixed mineral manure alone, every year, . . .	18.3¼	18.0¼	18.1¾	
Ammonia salts alone, every year,	23.1	22.0	22.2½	
Ammonia salts and mixed mineral manure, every year, .	35.0½	37.2½	36.1½	
14 tons farmyard manure, every yr.,	33.1¼	37.1¾	35.1½	

Comparing the amount of produce obtained by the use of farm-yard manure, with that obtained where only the ash of an equal quantity of the same was used, it is evident that farm-yard manure effects something more than merely to restore the ash-constituents to the land; and this result, of itself alone, is sufficient to show the error of the "mineral theory of agriculture."

The land used in the above experiments, although somewhat exhausted in regard to the growth of wheat under the system of high cultivation which there obtained (as was remarked before, see page 95) was still rich in available ash-constituents; consequently, the application of these only as manure, was not attended with increase of produce, but wherever ammonia was supplied, the produce was increased.

These results then are in direct opposition to Liebig's theory. They also show that all hope of obtaining annual crops of grain, or of increasing the amount of produce of crops generally, by supplying merely the ash-constituents of the plants grown, as manure, must be abandoned; and that, in the generality of cases, in order to render fully effective the natural resources of lands, nitrogenous air-food must be supplied. To furnish this supply is one of the chief objects of the growth of fallow crops; hence the advantage of a rotation of crops wherever the production of hay or grain is the chief object.

The difference between Liebig's doctrine and the conclusions arrived at by Lawes and Gilbert, as the result of their experimental researches, does not relate to the abstract theory of plant nutrition; but to the system of agricultural practice. Liebig ascribed fertil-

ity and the efficacy of manure, solely to the amount of available ash-constituents in land, and the advantages of rotation mainly to the unequal requirements of different plants for those substances. Lawes and Gilbert, on the contrary, have shown that fertility is not proportionate to the amount of available ash-constituents in land; that the efficacy of manure is not proportionate to the amount of ash-constituents it contains; that the exhaustion of land, in that instance, at least, consisted in a relative deficiency of nitrogenous food-material; that the advantage of rotation consists more in the accumulation of nitrogenous and carbonaceous food materials in the farm-yard manure, than in the difference between the ash-constituents taken from land by grain and fallow crops; and that the requirements of cultivated plants cannot be measured merely by the results of their analyses.

The value of these results, thus obtained, can hardly be deemed as over-estimated by the opinion lately expressed by Mr. Thompson, M. P., "that during the last twenty-five years, there has not been any addition made to agricultural knowledge, which approaches, in importance, to the insight into the true principles of cropping and manuring, obtained on the experimental farm at Rothamstead."

The particular conclusions and general views which have been thus arrived at, have been vehemently disputed by Liebig, who has sought to maintain that they are at once totally erroneous, and perfectly confirmatory of his "mineral theory of agriculture."

This paradoxical position he arrives at by contending, that the "mineral theory" of agriculture comprised ammonia and its salts, among the mineral substances which were considered to determine the fertility of the land and the efficacy of manure; and which it was, consequently, necessary to return or supply to land in order to maintain and increase fertility.

This claim, however, is inconsistent with Liebig's original exposition of his views, and with the pointed antithesis constantly maintained in all his writings, between the atmospheric food of plants, viz., carbonic acid, water and ammonia, whether furnished directly by the atmosphere, or indirectly from within the soil; and those materials derived exclusively from the soil which are "mineral substances, and as such are indestructible by fire, and, consequently, remain as ashes after the incineration of the plants, or of their parts." It is also inconsistent with the general interpretation of his "mineral theory" by other writers on the subject.

Moreover it appears that, (if we except as unimportant, the less than half of one per cent. of ammonia corresponding to the ammonio-magnesian phosphate which his manure contains,) in the specification of the patent which was, or ought to have been, the embodiment of Liebig's "mineral theory" in relation to practical agriculture, neither ammonia nor its salts were included among the mineral substances mentioned in the recipes and directions given by him for the preparation of manures. In his Address also, although ammonia was stated to have been added to the manure in the first year, still the prospect of being able to exclude it altogether was spoken of as probable; and in the third edition of the *Letters on Chemistry*, a whole letter was devoted to the argument, that an artificial supply of nitrogen was quite a matter of indifference; for though such a supply would exercise a favorable influence on vegetation, still, if it were not given, all the requisite nitrogen would be obtained from the atmosphere.

The customary routine of agricultural practice, defective as it may be in some cases, has become established by observation and experience, and by the exercise of the same mental powers which are employed in scientific research. Though their exercise may be limited by the practical object in view, there can be no doubt that, in reality, agricultural customs represent natural facts to a greater extent than science is yet competent to explain. To those who do not, like Liebig, consider the farmer to be "destitute of understanding," the prejudices characteristic of even the rudest practice will, therefore, appear as the exponents of those peculiarities of climate, soil and other circumstances, which lie at the root of the practice adopted. However vague and unintelligible such prejudices and empirical rules may appear, it is from the consideration of them, that a clue may be obtained to the scientific elucidation and improvement of agriculture. The science which is to be of value in agriculture, and whose value will be recognized by farmers, must grow out of the practice of the art, and the patient examination of its various details, and not be a mere speculative grafting upon it. The accumulated data of ordinary experience must furnish the basis for its construction, and its doctrines must rest upon evidence of reality, not upon mere probability. It may be a slow growth, but it must be a sure one.

THE AGRICULTURE AND INDUSTRY OF KENNEBEC COUNTY.

Being Part Second of a Survey of Kennebec County, continued from the Report of 1865.

BY SAMUEL L. BOARDMAN.

CHAPTER I.

Grass Lands and the Hay Crop.

A district of country which is exclusively or mainly a natural grass growing section, has within itself all the elements of successful agriculture, provided its operations are conducted with system and economy. With grass we have all kinds of stock; with stock the means of working and dressing our farms, furnishing our tables, providing our clothes, and all else that is desirable or necessary. A county having a soil naturally adapted to grass, is, in a great measure, able to live within itself, and not be dependent upon an exchange of commodities with other districts. The same is true, though in a less degree upon a single farm. If the soil is natural to grass, strong and moist, the farmer has at hand the means to secure whatever he desires; or, to apply the old proverb he has "corn, cattle and manure." In fact, grass and stock husbandry is really the only branch of farming which seems to render a man independent. Upon light, thin soil, the herbage is generally scanty, and what grass is made to grow is done by aid of liberal manuring, which, as is often the case must come from off the farm either in the form of purchased fertilizers or purchased hay. Where the reverse is the case, what the farmer has to buy, is done with commodities sold from the farm without any detriment to what remains. A farmer living upon a farm of such a character that he is obliged to grow grain crops chiefly, or follow market gardening, is perpetually dependent upon those farmers who have better natural locations and can grow the grass to furnish both the stock and manure he requires but cannot produce from his own acres without making an exchange. Natural advantages are

therefore in favor of the farmer who has what is commonly termed a "grass farm."

The county of Kennebec forms such a district as has been sketched above, and stands foremost in the State in the number of tons of hay produced, and the value of its farm stock. According to the census of 1860, the product of the former was 107,511 tons, and the value of the latter $1,637,826. With very few exceptions all the farmers in the county have farms especially adapted to grass culture. The exceptions are to be found in narrow districts of light, thin soil, or in localities of limited extent whose surface does not admit of being worked or seeded in the best manner. A few sections of the county are so unfavorable to farming operations, as to be almost devoid of habitations, such as the rough rocky tract of land forming the eastern part of the town of Chelsea, the great bog in Sidney, the uneven, ledgy portion of Winslow, &c., &c. The towns of Fayette, Mt. Vernon, Vienna and Rome, are very broken; the soil is strong and rocky, particularly in the latter town, though it comprises some good farms. These towns are good grass towns, but on account of their uneven surface are not so favorable for mowing fields as other localities in the county. They have rich pastures and produce stock that ranks among the best in the county. Along the river, in the towns of Litchfield and West Gardiner, is considerable level land, in the former town the soil being sandy, and in the latter nearly a stiff clay. The eastern part of the town of Augusta is unproductive, a large part of it being low and boggy. On the plains in Waterville, and in the town of Wayne, are small tracts of sandy land, and a large portion of Clinton—the most northern town in the county—is level, the soil being light and less adapted for grass than other parts of the county. These few exceptions, however, are not of sufficient importance to receive much consideration, in judging of the grass growing capabilities of the county, as the fine grazing and mowing lands of the river towns, as well as those of China, Albion, Windsor, Readfield, Winthrop, Wayne, Monmouth and Litchfield, are of such quality and extent as to justify the assertion that the county of Kennebec forms the richest grazing district in the entire State, of the same extent.

The long preëminence which the county of Kennebec has enjoyed, as the foremost stock growing district in Maine, is due not only to its superior natural advantages, but to the judicious system of management which has been bestowed upon the land. And for

the causes of this system, we must look to the intelligence of the farmers of the county from very early times, and to the agencies of the agricultural press, agricultural societies, and the example of such distinguished agriculturists, residents of the county, as I have spoken of in a previous chapter. They did much, both by precept and example, towards establishing a better system of farm management than was common throughout the State, and their influence is felt and seen at the present day. The power of education and intelligence, its abiding effects, and its especial value to farmers, are thus witnessed in a marked degree.

I judge that about two-thirds of the arable land in the county is appropriated to what is termed grass land, i. e. for pasturage and hay. There are no reliable statistics upon which to base this opinion, and it has been formed from personal knowledge gathered in visiting the various towns in the county. As the culture of grain crops receives but little attention, and as large tracts of land in some parts of the county are yet in wood, this estimate will, I think, be accepted as nearly correct. The average yield of hay may be set down at one ton and a half to the acre. Some fields it is true produce much more than this, and on a large proportion of the land less than one ton to the acre is grown; but taking the entire county together, the above is a fair (I am almost afraid it is a large) estimate.

Timothy or herdsgrass (*Phleum pratense*) is the chief variety of grass found in our fields and pastures, and its natural presence is everywhere regarded as indicative of good, substantial, rather moist soils, and when aided by proper drainage, well adapted for the production of cereals. Flint, in his "Grasses and Forage Plants," says: "As a crop to cut for hay it is probably unsurpassed by any other grass now cultivated. Though somewhat coarse and hard, especially if allowed to ripen its seed, yet if cut in the blossom, or directly after, it is greatly relished by all kinds of stock, and especially so by horses, while it possesses a large percentage of nutritive matter in comparison with other grasses." It attains its full vigor of growth in the second year after sowing, and the practice among our farmers has been to sow red clover in connection with it, but many are beginning to abandon this practice on account of the different periods of blossoming of the two plants. Timothy being invariably later than clover, the former must often be cut too green, before blossoming, when the loss is great by shrinkage, and when the nutritive matter is considerably less than at a little

later period—or the clover must stand too long, when there is an equally serious loss of nutritious matter and of palatable qualities in that.

Next to timothy, the red clover plant (*Trifolium pratense*) is most largely cultivated as a forage crop. This plant is most properly regarded as a means of great fertility to the soil; so much so indeed, that its introduction into England is said to have produced a complete change in the system of husbandry there pursued, leading as it did to most important improvements in the rotation of crops. In many particulars red clover is one of the most valuable plants grown, and I have been somewhat surprised to find it so little appreciated and so little used for other purposes than forage in many parts of the county. The action of its roots serve to pulverize the soil, as the air is sure to go wherever the roots extend, while chemically they are known to fix the gases so valuable in enriching the soil, and when the roots decay they add largely to the fertility of the land. By its rank growth and thick foliage it helps to destroy and keep down the weeds, while the shade afforded to the soil also adds to its fertility. As a crop for green manuring, clover is also highly prized by the best farmers throughout the country, and in many portions of the State of New York* it is said to lie at the very foundation of the system of agriculture pursued, in so high estimation is it held for the purpose of manuring. In this latter respect it is little used by the farmers of Kennebec, a thing at which I much wonder, as it is on tenacious or stiff soils a far better and cheaper fertilizer than the special manures so largely used. I earnestly recommend a trial of clover for this purpose, by our farmers, as experiments made upon a quarter or half an acre would soon demonstrate its value and practicability. For a forage crop the seed should always be sown in spring.

In seeding land to grass most farmers in the county make use of redtop (*Agrostis vulgaris*) in connection with herdsgrass and clover. The quantity sown is generally one peck of the former with one peck of herdsgrass seed and fifteen pounds of clover to the acre. The quality of this grass is much influenced by the soil upon which it grows, and as a pasture grass it is much prized. It is also a less exhausting crop than timothy, as it contains only four or five per cent. of potash, while timothy contains thirty per cent.

We have in some of our fields of thin soil, a variety of grass

* Transactions of New York State Agricultural Society for 1859, page 321.

which many call June grass, but which is in fact blue grass or wire grass (*Poa compressa*). The true June grass or common spear grass is the real Kentucky blue grass, (*Poa pratensis,*) which is not the variety generally found on run-out fields in this State. The amount of foliage it contains is scanty, otherwise it would form one of our most valuable grasses as it contains a large amount of nutritive matter. Cut early it makes excellent hay, if left until ripe it is almost worthless. Flint says of this grass: "It is an exceedingly valuable pasture grass on dry, rocky knolls, and should form a portion of a mixture for such soils."

Witch grass (*Triticum repens*) has obtained a pretty strong hold upon much of the land in the county, and where it cannot be subdued is harvested as hay. It forms a rich feed when cut early, but is regarded as a pernicious and troublesome plant by all good farmers.

In every field there is naturally a mixture of grasses which produce more or less according to the season; and to these the farmer should give special attention, as a larger yield of a better quality of grass can be produced by cultivating them in due proportions. Seeds from many of them should be procured and sown upon situations favorable to their growth, and by this means the land will produce a larger yield of a better quality of hay and will hold out much longer than where this natural adaptability is not studied. Among the most valuable of these grasses are the following: Orchard grass (*Dactylis glomerata*), tall fescue (*Festuca elatior*), rye grass (*Lolium perenne*), and meadow fescue (*Festuca pratensis*).

There is in this county comparatively little interval land, but in some sections are quite extensive tracts of low meadows, situated upon streams and brooks that furnish annually at no expense of seeding or manuring, a heavy yield of very good grass if cut early. The varieties growing in such locations are foul meadow (*Poa serotina*), rough-stalked meadow grass (*Poa trivialis*), blue joint (*Calamagrostis canadensis*), meadow fescue (*Festuca pratensis*), with other varieties of less value known as cut grass (*Leersia oryzoides*), Indian rice or water oats (*Zizania aquatica*), and other sorts coming under the term *carex* or sedges. The first named varieties possess considerable nutritive value, and where they are found to considerable extent, the hay if cut early, makes very good forage for young stock and sheep. Meadow lands producing these natural grasses are much improved by mowing, become harder each year, and, as known, the finer and better grasses work in.

On the meadows bordering upon the Cabbassa-contee in Gardiner, West Gardiner and Litchfield, is a grass having a coarse rough stem, which when dried breaks all up, that is called "Pipe grass," of which I am unable to give the scientific name. It is considerably esteemed as among the best of the meadow grasses, especially for sheep.

The pastures in this county are generally of a superior character, yielding a good supply of rich feed. That they are not overlooked or neglected is attested by the excellent stock for which the county has so long been famous.

I desire to add a few suggestions which have occurred to me while visiting different portions of the county, and which I think will be found of sufficient importance to command the attention of farmers generally.

During nearly six months of the year the farmer's stock is confined to yards and stables, obliged to subsist upon dry forage, varied occasionally by roots or other provinder. It is often the case that hay imperfectly cured, and fit for little else than litter, is fed out to them which they are compelled to eat or go hungry. Now it is an important question whether in curing hay farmers do not as a general thing spoil it completely as forage for stock, or in other words *make it* too much, burning and drying it more than is necessary; and whether by a different course of curing, the hay might not, when completely made approach very nearly to grass in its most essential characteristics. I believe this matter of curing hay to be of sufficient importance to warrant a brief discussion of the principles involved in the operation.

It is well known by all farmers that grass furnishes the proper food for animals, and that they thrive and fatten upon it, when they often grow poor upon the same article after it has matured and been cured as hay. Now the principal constituent of grass in the first stages of its growth is water, the amount of solid matter being comparatively small; as it grows older the sugar and soluble matters increase, until after a certain period, when they gradually diminish to give place to the formation of woody matter. According to an analysis made by Prof. Thompson of the University of Glasgow, it appeared that a sample of rye grass on the eighteenth of June contained 76 19 per cent. of water, and 23.81 of solid matter; and on the thirteenth of July, samples contained 69.00 per cent. of water, and 31.00 of solid matter. Now as sugar is an important element of the food of animals, and as this appears quite

largely in grass, the farmer should endeavor to cut at the time when the greatest amount of matter soluble in water, is to be found in it. Any farmer of ordinary intelligence, who has been at all observing when engaged in hay-making, is aware that this period is earlier in the season than when it is forming its seed, as at that time the woody matter largely predominates. This woody substance is insoluble in water, and consequently not so well calculated to serve as food for animals, as those substances that assume a soluble condition in water. Hence it should be a study with all farmers to cut and cure their hay for the use of their farm stock in winter, at such a time, and in such condition that it shall approach as nearly as possible to grass in its most perfect state of nutrition.

Some very careful and thorough experiments were undertaken some years ago by the gentleman above mentioned, and given in his very valuable and suggestive work on the "Food of Animals," to ascertain whether hay, by the process and exposure necessary to its proper curing, lost any of its soluble constituents. From these experiments it appeared that 100 parts of hay were equal to 387½ parts of grass. This amount of grass should contain of matter soluble in hot water, 28.13 parts, and in cold water 8.21 parts. But an amount of hay equivalent to the above amount of grass, (100 parts,) contains only 16 instead of 28 parts soluble in hot water, and 5.06 instead of 8¼ parts soluble in cold water. This shows that during the process of curing the hay, a very large part of the soluble matter that was found in the grass has disappeared; and that by the process, in the above instance at least, the soft, juicy and tender grass has been converted to woody matter by washing out or decomposing its sugar and other soluble constituents. This, Mr. Thompson says, explains why cattle consume a larger amount of hay than is equivalent to the relative quantity of grass; as he found by careful trial that a cow who was thriving on 100 pounds of grass, required 9 pounds of barley or malt, *in addition* to 25 pounds of hay—showing that in drying, the hay had deteriorated in value; for had it not, 25 pounds of it should have been able to retain the animal in the same condition that 100 pounds of grass would.

The chief cause of badly cured hay is the presence of water in it, by which fermentation is induced, and in consequence of fermentation, one of the most valuable constituents of the grass, its sugar, becomes destroyed. Water may exist in hay, either because it is not completely removed in the process of drying, or

because it is absorbed from the atmosphere after it has been cut. Now in order to cure hay completely, it is necessary to dry it thoroughly without burning it all up, but I cannot say that this can be done *perfectly*, without resort to artificial drying, which, with most farmers, is simply impossible. Experiments have demonstrated, however, that the 81 per cent. of water found in some varieties of grass, can be quickly removed by subjecting it to artificial heat—a temperature of 120 degrees being considered as about right. By subjecting the newly cut grass to this heat—the grass being cut before fully grown—the largest portion of the water is removed, and the green color is retained—a matter of no small moment. If the grass that has thus been artificially cured is closely examined under a magnifying glass, it will be found to consist of a series of minute tubes, and by placing it in water it will completely fill these tubes, so that the grass will assume to a considerable degree its original appearance. By this means of curing or preserving grass, all its constituents are retained in a state of integrity, the sugar, by the absence of water, undergoes no decomposition, the color of the grass is the same as when growing, and the soluble salts are not exposed to the risk of being washed out by the rains, as in the usual method of curing hay.

The mowing machine and other improved implements have made a complete revolution in the work of harvesting hay, and if I mistake not will yet work a greater revolution in the method of curing it. Formerly, when all the work of mowing was done by hand, it was necessary for the mowers to commence their work very early in the morning, in order not only to get down as much grass as could be taken care of during the day, but also to perform the hardest part of their work while yet the cool part of the day was with them. Mowed when the dew was on, the grass consequently needed spreading, shaking up and turning in order to dry it out. But now that the mower performs the hardest part of the work, the grass can be mown down after the dew has dried off. This being the case it needs much less stirring to cure it, than were it mown down while the dew is on, and much less time in order to have it in a proper state to haul in. The dew dries off sooner from standing grass, than from grass that has been cut with the dew on; and grass cut without any dew upon it needs but little care to properly cure it. This, according to my own opinion, is the proper time and manner of making hay, and accords very nearly with the mode followed by Gen. Thompson of Massachusetts, which

was quite extensively noticed by the agricultural press some few years since. His plan is as follows:

On a good day he cuts his grass, leaving off about 9½ o'clock A. M. His men then devote themselves to spreading, turning, and stirring up the hay that the air may pass through it, and all the external moisture be thoroughly dried. After dinner this is done again and continued till about 3 o'clock, when the hay is raked into winrows, pitched on to the cart, and stored in the barn. Of course, if the day is not a good one, the hay is cocked and left till the next good day. Nothing is done to prevent heating, though salt, about four quarts to the ton, is sometimes thrown over it from the idea that cattle will better relish the hay; often no salt is used, and he does not consider its use essential. The result is, that in the spring of the year the clover in his barn, cut the previous summer, is bright, the heads blushing as if just mown, and breathing as delicious an aroma as when taken from the field.

In view of the above facts, the question occurs: To what extent and in what way can our farmers adopt some method of preserving hay, so as to continue to their stock in winter the natural and superior food furnished them by summer pastures? They cannot use the waste heat of the large chimneys common in manufacturing towns, as an English writer suggests, on account of the great distance that it would be necessary, in this State, to cart the hay back and forth; but we think several neighbors might join together and construct cheap and somewhat temporary drying houses, and by means of a small quantity of fuel, hay, corn fodder and other forage crops could be perfectly *preserved* or cured in accordance with the facts given above, and at small expense. True, in a dry climate like our own, this matter is not of so much importance as it is in a damp, moist climate, like that of Scotland, for instance; still when we remember what wet hay seasons we often have, and how much hay is damaged by being improperly cured, on account of a long succession of rainy or moist days, during haying, the matter becomes one worthy of serious consideration. If this latter plan, however, seems impracticable, let us see what there is of value to all farmers that can be gleaned from the suggestions I have given above. I think the following may be stated as among them:

1st—That we do not cut our hay soon enough by several weeks.

2d—That hay, by our present mode of curing it, loses a large part of its most valuable constituents.

3d—That to be properly cured, it should when this operation is performed, resemble *dried grass* as much as possible; and that to accomplish this it only needs to remain exposed to the air long enough, after cutting, to have the water dried out, without being all burnt up by the sun.

4th—That the right time for cutting grass is when it contains the largest amount of matter soluble in water, and not after this has changed to woody matter, as it does when its growth is passing into seed. Any farmer of practical knowledge and observation can determine with sufficient accuracy when this period occurs.

The great majority of farmers in the county are too sparing of hay seed when laying down lands to grass. A good catch, or a heavy yield of grass ought not to be expected, even where the soil is in a very fair condition, if a scanty quantity of only two or three varieties of seed are used. Some of the best farmers in the country use from forty to forty-six pounds of grass seed to the acre, using from ten to fifteen varieties. This gives from eight to ten seeds to every square inch. In what striking contrast to this is the niggardly seeding practiced by too many of our farmers! It is certainly to be hoped that in future a greater number of varieties of grass seed will be used in seeding land, and that the quantity will at least be doubled. The usual custom among farmers in the county is to seed in spring, although autumn seeding is practiced to some extent.

I feel like urging upon the attention of the farmers of the county the benefits of green manuring with the red clover plant as one of the things to be experimented with, and as promising most satisfactory results. Mr. Geddes in his report on the agriculture of Onondaga county, New York, says: "The agriculture of Onondaga county is based on the clover plant. It is used for pasture, for hay, and for manure. Strike this plant out of existence, and a revolution would follow that would make it necessary for us to learn everything anew in regard to cultivating our lands. What their value would be without clover, we will not attempt to conjecture." If its benefits are so marked in the portion of New York State mentioned, I cannot doubt that in our own county results no less marked would follow its application. The cities and large towns within the county are not yet of sufficient extent to furnish from their stables enough manure to keep in high condition land situated several miles away; and for the purpose of keeping up the fertility of grass farms, those from which considerable quanti-

ties of hay are sold, and upon which in consequence thereof, but little stock is kept, I would recommend the culture, consumption upon the farm, and turning under as a green manuring crop, of red clover.

Both experiment and chemical analyses have demonstrated that the manure of animals fed upon clover hay, is worth bulk for bulk, five times as much as manure from animals kept upon straw and other refuse fodder. It consequently follows that if the manure from clover hay is so much superior to manure from straw, the turning under the clover must produce results equally satisfactory. The influence exerted by the roots of this plant in loosening and pulverizing the soil is also of immense benefit and should not be overlooked. I am satisfied from the nature of the soil throughout a large portion of the county, and from the system of farming pursued, that a rotation of crops comprising the frequent plowing under of a crop of clover when growing, would work almost magical results in our farming and in a short time be regarded as essential to successful husbandry. The first year the clover may be cut for hay, and the second plowed under as a manuring crop. The time for performing this operation is when the plant is in full blossom.

It may be urged against this practice that the profit of a crop for the year will be lost, or in other words, the land must lie fallow. But to compensate for this, the yield of clover turned under increases the amount and depth of mold in the soil, thus fitting it to produce a heavier crop the next season, while the expense and labor of hauling and applying animal manure is avoided.

But where it is not deemed advisable to follow this system, that of top dressing grass lands where the crop is sold off annually, as it is in some portions of the county, must be resorted to, or complete failure and sterility will be the result. In a county like our own, which must always be one largely devoted to the grass crop, a top dressing of grass lands once in four years will be found of great advantage not only in increasing the annual yield of hay but in rendering unnecessary the frequent plowing and re-seeding which must be the common course where top dressing is not practiced. If the farmer has not animal manure to spare from his hoed crops for the purpose of top dressing, other manurial substances can be used. Muck or meadow mud, composed with a small quantity of bone manure and impregnated with lime—the compost having been prepared in early summer—spread upon grass land in

autumn will give astonishing results. Leached ashes form a most valuable top dressing. Liebig says that with every one hundred and ten pounds of leached ashes applied to the soil, is furnished as much phosphate as five hundred and seven pounds of the richest manures could yield—and phosphates are what is wanted upon all our soils. Farmers in the upper towns in the county are fully aware of the value of leached ashes as a fertilizer, especially as a top dressing for grass lands, and make a judicious use of all that can be obtained. Several farmers in Waterville have been induced to engage in the potash business, almost solely for the facilities it offered for supplying their farms with leached ashes as a manure. Many in that town, with whom I am acquainted, who occupy clayey loam farms, have for several years past applied leached ashes as a top dressing to their grass lands at the rate of about one hundred and fifty bushels to the acre, and the results of this have been most marked. In some instances the increase of hay per acre has been more than doubled. It seems strange to me, when ashes both leached and unleached are known to possess such high manurial qualities, that farmers in other parts of the county are so negligent as to their value. During the past six years I have seen vessel after vessel loading with leached ashes at the wharves in Augusta and Hallowell, to be transported to the "truck gardens" of Long Island, to assist in growing vegetables for the New York market. How the farmers of Kennebec can allow them to be transported from their very doors to enrich the lands and the farmers of a distant State, is beyond my comprehension.

I believe that by the systems of increased seeding, top dressing, and the plowing under of clover as a green manuring crop, which I have suggested, the yield of hay in the county of Kennebec may be easily doubled in four years: while by the attention to curing hay for the use of our stock in winter but two-thirds of the amount now required to keep a stock of cattle will be necessary, thereby giving an extra third for the purpose of keeping a larger number of stock, or for sending to market. How much this will increase the value of the farms and the independence of the farmers in the county, my readers can estimate as well as I.

Weeds.

Weeds are not a sign of good husbandry, but notwithstanding this they *will* grow, forcing their way into fields, pastures and cultivated ground, taking from the soil a portion of the nourishment due to growing crops, and reducing the quality and quantity harvested. Some of the most troublesome are here noted.

Ox-eye Daisy, or White Daisy (*Leucanthemum vulgare*) has gained a strong foot hold in mowing fields on the east side of the river, but is rarely found to much extent upon farms in the western portion of the county. It occurs in such abundance in China, Albion and neighboring towns, as to render the fields in early summer snow white with their large blossoms. Riding through these towns on the last of June, 1865, I saw upon a side hill three-fourths of a mile in advance, a field of some four acres in extent which looked as white as the driven snow—so white indeed that I was greatly interested as to what could produce it. On approaching, I found the field to be completely occupied by this pernicious weed, then in full flower.

The seed are very tenacious of life and will germinate after passing through the stomach of an animal. Various means have been suggested for destroying it, one of which is to feed it down by sheep. But this is never to be recommended as the sheep will grow poor upon it and more will thus be lost than will be gained by ridding pastures and fields of the weed. Thorough cultivation is the only thing that will completely eradicate it which can be given as follows: The first year plow the sod thoroughly, plant with corn, hoe and cultivate well once a week. The next year sow and plow in two crops of buckwheat, and the third year manure well and plant corn again, then again two crops of buckwheat for two years more. This course will completely exterminate the daisies and the land will be left in excellent condition.

If cut early, cattle and sheep *will* eat it if they can get nothing else; but it makes a poor bitter fodder, and should be kept out of the land if possible.

Rag Weed, or Bitter Weed (*Ambrosia trifida*) is in many localities very troublesome, and usually makes its appearance in mowing fields after grain crops. Clean culture and rotation in crops will generally clear it from the land.

Canada Thistle (*Cirsium arvense*). This is an extremely annoying weed from the fact that it spreads both from its seeds and roots. However, with close attention it can be eradicated in a

single year, but if the farmer is indifferent, and allows it to spread it will soon cover every portion of his soil. It has become established with this weed, that the roots cannot live unless they breathe through their lungs, the leaves. Therefore the course of treatment is plain: Keep the plants above ground from growing, and they will die out in a single year. In a small garden they can be cut daily, and upon larger patches the ground can be covered with boards, saw dust or spent tan, or if plowed deep and often they can be thus smothered.

Burdock (*Lappa major*) is well known by its coarse, rank growth, and by its large adhesive burs, which often cause serious annoyance to sheep and cattle. The plant is a biennial and easily destroyed by cutting off the root a few inches below the surface, especially if this course is followed up for some years.

Mullein (*Verbascum Thopsus*) is common in pastures and along fence sides. The second year it sends up a single tall stem which produces a large number of seeds, and when ripe these are widely scattered by the winds and also carried in the fleeces of sheep. The plants may be destroyed by cutting them up with a hoe, or, when the ground is moist pulling them up by means of the stem.

In low situations Poke weed or Indian Poke (*Phytolacca decandra*) is quite troublesome. It is of a rank, fleshy and succulent growth, and may be destroyed by cutting it off with a stiff hoe, below the surface. The root is perennial, and the stalk usually dies down before the time of cutting grass on our low meadows.

Purslane (*Portulaca oleracea*) is an annual weed, and is extremely annoying in many gardens, on account of its being so very difficult to destroy even after the stem is cut off. I have found that it cannot be kept out by simply cutting it off at the surface by the shuffle hoe, it must be pulled up carefully by the roots and carried from the enclosure. Although found in many gardens I have seldom noticed it in fields.

Plantain—of which there are two common species, one *Plantago major*, the other *P. lanceolata*—is another unsightly weed, common in gardens, door yards and along walks. Although not so troublesome as many other weeds, still the neat and exemplary farmer or gardener should not tolerate either species. Both are perennial rooted and can easily be destroyed, in small plats by cutting off the root beneath the surface. In fields, thorough culture and a rotation of crops—those systems which do so much towards rendering the land clean and productive—will eradicate them.

I have just said that Witch grass or Couch grass (*Triticum repens*) is by many regarded as a weed and pest, although some are obliged by circumstances to make use of it as hay. In consequence of its great number of long creeping roots and the tenacity of its growth, it is very difficult to eradicate, and is very justly regarded by good farmers as one of the most troublesome and obstinate of weeds. Where it has taken complete possession of the ground, the roots form a thick mat, rendering the soil impossible to be pulverized, and absorbing the moisture which should go to more valuable plants. Where the land is fully taken up by it, if sward land, it better remain as mowing, for if cut early it makes very good hay. Corn will also succeed very well with it, but it is useless to expect a crop of potatoes from land infested with this weed. A good farmer in the western part of the county who has been successful in subduing it gives me the following as his method of proceeding:—He first sows a piece of land with oats and plows the land in the fall after the grain has been harvested. As early the next spring as it is possible to do so, the ground is thoroughly harrowed three times with a heavy harrow, and it is then plowed again. Sometimes after planting in the spring it is again harrowed and then planted with corn and potatoes. In this way the witch grass is so much subdued as to be of little if any trouble in cultivating the ground.

There are a class of shrubs which grow along fences and roadsides, common in some portions of the county and entirely unnoticed in others, such as the Wild Blackberry (*Rubus villosus*), the Elderbush (*Sambucus canadensis*), the Alder (*Alnus serrulata*), &c., which no good farmer should allow to grow upon his premises. A generous use of the bush-scythe, followed up for a year or two, will clear them out and render the field and road fence sides clean and attractive, instead of as now being unsightly and the nurseries of numerous other foul weeds which scatter their seeds over the adjoining fields with every autumn wind. The absence of these forbidding and worthless shrubs in the situations mentioned, is a sure sign of the thrifty and careful farmer.

Although the above and some few other weeds are found in many parts of the county, they cannot be said to occur in very great quantities, and I think the field culture practiced by our farmers will be found as clean and free from these noxious plants, as in any section of the State.

CHAPTER II.

Stock Husbandry.

In the very interesting communication from Hon. Sanford Howard, given in the first part of this work, are many important statements in relation to the early introduction of farm stock into Kennebec county, and if in the following notes the reader observes some repetition, I trust it will be pardoned, as they are only mentioned here in order that this chapter may be more complete in itself, and while giving some account of the early importations, show also the present general condition of the various breeds of farm stock in the county.

In 1630, Capt. Mason imported into New England several cows of the Danish breed, which, distributed through Maine, Massachusetts and New Hampshire, soon became mixed with the cattle that had been imported into the Plymouth and Massachusetts colonies, and which may be mainly called Devons, and formed that cross or breed of cattle denominated "Natives," or, in other words, the "Old Red Stock of New England." But few facts can be obtained concerning the importation of cattle into this State between the dates above mentioned and 1791–'92; but it is probable that they were occasionally brought in by masters of vessels who traded with different parts of Europe and with the West Indies. In 1791–'92 the late Mr. Charles Vaughan, who, with his brother, the late Benjamin Vaughan, LL.D., both gentlemen largely interested in agriculture, had previously migrated from England and settled on an extensive estate in Hallowell, imported a number of cattle from England. Their first importation was made in 1791, and consisted of two cows and two bulls, the animals arriving in the Kennebec river in the fall of the year. The bulls were selected from the cattle in the Smithfield market, and the cows from the milch farms near London. These cattle were probably the Bakewell breed, which was an improvement of the Longhorns, as they were called. During the war with England, in 1814, an English vessel was captured and taken into Portland, that had cattle on board. A bull from this lot, a few years subsequently, stood in part of Kennebec county, and was known as the "Prize Bull." He left some good stock. "Up to 1718, therefore," says Dr. Holmes,* "the *native* cattle of Maine, so called, and indeed, of all New England, were a mixture of the Denmarks, imported by Mason; the Devons,

* Agriculture of Maine, 1855, p. 80.

brought over by the Pilgrims of Plymouth, and probably, of some black cattle, brought at some time from the West Indies or the Spanish Main; the Vaughan importation, and the "Prize Bull." There were also occasionally found some polled or hornless cattle, which were probably introduced from England or from some of the British provinces adjoining us."

About the year 1817, an increased attention was given to the rearing of stock. At this time the old "Massachusetts Society for Promoting Agriculture" (many farmers in the District of Maine were members of this Society) offered a premium of $100 for the importation of a thorough-bred Durham Shorthorn bull. This resulted in the procuring a fine animal, imported into Northborough, Massachusetts, by the late Stephen Williams, Esq.,—the first Shorthorn bull imported into the United States—at a cost of about $1,000. He arrived November 5, 1817. He was sired by Denton, by Comet, by Favorite, &c., &c. His dam was by Baronet, granddam by Cripple, &c. He was called "Denton 2d." This arrival was kept in Northborough and Worcester, until 1827, when he was presented by Mr. Williams to Dr. E. Holmes of Gardiner. He was the first thorough-bred Durham Shorthorn ever brought into Maine, there having been a few half-bloods previously introduced. Denton was at this time about seven years of age. He stood a part of the following season at Gardiner; afterwards two seasons at Livermore, and was from thence carried to Starks, in Somerset county, where he died of old age in April, 1830.

A grade Durham bull, called Hercules, sired by Cœlebs out of an imported cow, was brought to Pittston in 1826, by Gen. Henry Dearborn, where he stood a few years, and was afterwards transferred to Winthrop. Soon after this, the late John Davis of Augusta, introduced into Kennebec county, three full blood Durhams, viz.: the bull Jupiter, and the cows Daisy and Europa. They were purchased of Col. Jaques and were sired by Cœlebs out of his imported cow Flora. Jupiter was kept in Readfield, Winthrop and Wayne, for sometime, and his stock proved excellent milkers. About the same time, Reuben H. Greene, Esq., of Winslow, commenced breeding Durham stock, and to him our farmers are indebted for the introduction of some of the best Durham blood brought into Maine. Sanford Howard, while he resided in Hallowell, introduced a number of choice animals, and was quite an extensive breeder of neat stock. In 1844, Mr. J. W. Haines, who also resided in Hallowell, purchased of Messrs. Sotham & Corn-

ing, Albany, N. Y., (who imported their stock from England in 1841,) the full blooded Hereford bull "Albany." He stood in various towns in this county, and sired some of the best working oxen ever raised in the State.

The Devons have never been bred extensively in Kennebec county. Among the first to introduce them—I am unable to state the date of their introduction—were the Messrs. Percival of Waterville. They obtained a full blood bull, which after service for a few years at Waterville, was sold to a farmer in Pittston. At the present time I believe there are no breeders of pure blood Devons in the county.

In 1852, Mr. William S. Grant of Farmingdale, procured a full blood bull and heifer of the Jersey breed, breeding them distinct for several years. In 1855, Dr. E. Holmes of Winthrop, purchased a thorough-bred Jersey bull and heifer of Samuel Henshaw of Boston, and from these two importations have come most of the Jersey stock now found in the county. Among those at present engaged in the breeding of Jerseys are Samuel Guild of Augusta, B. F. Chandler of Winthrop, Samuel Cole of Readfield, Levi Dow, W. A. P. Dillingham, Henry Taylor, Dr. N. R. Boutelle, and Samuel Kimball of Waterville.

Some years ago, Mr. Hiram Pope of West Gardiner, brought into this county from the herd of Mr. John P. Cushing of Watertown, Mass., a thorough-bred bull of the Ayrshire breed. This was the means of introducing this breed into Kennebec county, and subsequently John D. Lang of Vassalborough, and the late Dr. Timothy Boutelle of Waterville, obtained specimens of the breed, from which source the Aryshire stock in the northern part of the county descended.

Messrs. G. & G. Underwood of Fayette, are now the most prominent breeders of Herefords in the county. They are sons of Mr. J. H. Underwood, who commenced the breeding of pure blood Herefords in 1853 by the purchase of the bull "Waldo" and heifer "Victoria" of a breeder in Waldo county. They were bred from a bull and heifer imported from England by Capt. Pendleton of Searsport. In 1859 they purchased the bull "Croukhill 2d" of the Messrs. Clarke of West Grandly, Mass.; in 1862 the bull "Albany" of E. Corning, Jr., of Albany, N. Y., and in 1862 the young bull "Wellington Hero" of Fred. Wm. Stone of Guelph, C. W. The Messrs. Underwood are now engaged in breeding Herefords, and have a herd of nine pure blood animals and eleven grades. In no

portion of Maine can such handsome specimens of working cattle be found, as the towns of Readfield, Fayette, Mt. Vernon and Winthrop annually send out, and which form the great attraction at the exhibitions of the old Kennebec Society.

In 1864, Mr. Henry Taylor of Waterville purchased from R. A. Alexander of Bourbon county, Ky., a bull "Charleton" and a cow "Marygold," both of the Durham breed, and both herd-book animals. From them Mr. Taylor has been breeding since that time.

The most extensive breeder of pure blood stock in the county is Warren Percival of Vassalborough, who has now a herd of forty-six thorough-bred Shorthorns. The herd comprises six bulls, sixteen cows, nine heifers, and fifteen calves. Mr. Percival first turned his attention to the breeding of pure blood stock in 1860, and at that time purchased six cows and heifers of Mr. William S. Grant of Farmingdale. He also made some purchases of Mr. Wadsworth of Livermore, and in 1861 bought a thorough-bred bull bred by George M. Butts of Massachusetts, following up that by the purchase of other animals from the herd of Paoli Lathrop of South Hadley, Mass., and other eminent breeders. In this way and by judicious breeding, he has obtained a herd which was called by a gentleman from Massachusetts, a good judge of stock, and himself a breeder of some note, who has visited Mr. Percival's farm, the best herd—especially of cows—he had ever seen. Among the animals forming Mr. P.'s herd, I cannot forbear to mention the roan bull "Gen. Smith" three years old, which was bred by Milo J. Smith & Son of Northampton, Mass. He is by "Marmion," out of "Colona," by "Earl of Warwick" (Mr. Samuel Thorne's celebrated bull), while "Marmion" and "Earl of Warwick" were both sired by the famous "Duke of Gloster." It will thus be seen that "Gen. Smith" possesses as good blood as any animal in the country. Mr. Percival has made extensive sales of his animals to farmers in this county, and also in other parts of the State, and by his efforts and example has done a great deal towards improving the farm stock of our State.

In 1855, Thomas S. Lang, Esq., of Vassalborough, purchased a full-blood bull of the Dutch breed, of Mr. W. W. Chenery of Massachusetts, which has given good satisfaction to the farmers in that section of the county, and his services have been held in constant requisition. This breed uniting a hardy constitution with good milking qualities, will prove valuable to the stock of this latitude.

There are others in different parts of the county engaged in breeding to a greater or less extent, but I believe I have given the more prominent names, especially of those breeding pure blood animals.

The neat stock of Kennebec county may be said to be chiefly Durhams and grade Durhams. This breed seems to predominate, notwithstanding there are a considerable number of Herefords and their grades in towns on the west side of the river, while specimens of nearly all the other breeds found in our country are here to be seen. Breeders who have obtained a pure blood animal from any source and are thus improving the stock of their own district, deserve great credit, as all such efforts will gradually better the character of the stock in the county, and of course add greatly to its value. Agricultural societies, by offering premiums for the importation of choice breeds, have contributed much to elevate the character of our neat cattle and other stock, and have accomplished a work that could not have been so quickly done by individual enterprise. If the only proof of the benefits derived from the establishment of the old "Massachusetts Society" were found in the importation of the single bull, "Denton," into this State, it would be a convincing argument in favor of agricultural societies. That one animal has been of incalculable worth to Kennebec county and to the State of Maine. Another good work done by these societies in the matter of stock-breeding has been in the classification of breeds, and offering premiums for each one distinct. Previous to 1845 stock was not classed for premiums by the societies then existing in our State, and premiums were awarded for the *best bull, best cow*, &c., &c. Since then, by awarding premiums to distinct breeds, societies have helped greatly to induce farmers to exercise a more judicious care in breeding, and in this way have contributed directly to the development and perpetuation of known excellencies in breeds.

The county of Kennebec has given to the country some of the best performers upon the American turf. Chief among the distinguished horses known in this State, was the "Old Winthrop Messenger," a grandson of "Imported Messenger" (who was brought from England to New York in 1791.) He was purchased in Paris, Oneida county, New York, by Alvin Hayward of Winthrop, and brought by him into that town about the year 1816. Those who have seen him describe him as "a large, white, muscu-

lar horse, with a clumsy head, but well proportioned body and legs." His form and general appearance indicated a powerful animal, but he never exhibited any of those qualities which would have entitled him to be called "a fast horse." When his colts came into service they were found to be superior roadsters, and very many of them became fast trotters, and were possessed of great endurance. On this account they were sought after in the markets, and our farmers sold off their best animals, which were carried to other States, where they were trained to the course, and becoming celebrated as trotters, gave honor and reputation to the stock horses of States where they were subsequently owned, when in fact the reputation should have been given to Maine and her horse breeders. The names of some of the descendants of "Winthrop Messenger," raised in Maine,* which have been celebrated as trotters, will show the truth of this remark—Fanny Pullen, Tacony, Lady Swan, Henry, Lafayette, Celeste. Among the others, were Ice Pony, Tom Benton, Independence, D. D. Tompkins, Zachary Taylor, Mac, &c. So eminent a writer as Sanford Howard, Esq., in 1852, made the following remark: "Maine has, until within a few years, furnished nearly all the trotting stock of any note in the country." "Old Messenger" was kept as a stock horse, in various parts of this State, until between twenty and thirty years of age, and died in Anson, Somerset county, in 1833 or 1834. The Messengers were excellent horses for the road or for work, although they were late in maturing. The name became a standing recommendation, and was even applied to horses to whom it did not belong, as an inducement to purchasers.

While the Messenger stock was in the height of its popularity, a horse called "Quicksilver" was brought into Winthrop, where "Messenger" was also owned, and they were for some time rivals in the same town and county. "Quicksilver" was sired by "Dey of Algiers," a full blood, imported gray Arabian; his dam was a full blooded imported English mare. "Quicksilver" was, therefore, one-half Arabian and one-half English. He was raised by Gorham Parsons of Cambridge, Massachusetts, and was sold in

* The renowned Trustee, who performed the unparalleled feat of trotting twenty miles in 59 minutes 35½ seconds, was out of a mare—Fanny Pullen—that was raised in Maine. In 1849, Mac, a horse raised in Maine, won several matches against some of the most celebrated animals on the course. The dam of Mac was probably a descendant of Messenger, and his sire a Morgan, which has generally proved to be a most excellent cross. In 1851, Tacony, another Maine horse, beat War Eagle twice, though he was quite young, and in 1852 he won twelve races.

1818—being then thirteen or fourteen years old—to James Pullen of Winthrop. He was kept in this State six or seven years, and was then sold to Mr. Hamilton of Conway, New Hampshire, where he died at the age of twenty-one or twenty-two years. His color was nearly a dark bay. The beauty and splendid appearance of the Quicksilvers was in strong contrast with the heavy and sedate appearance of the Messengers, and the former, in a business point of view, for a while superseded the latter in popularity; but as the Messenger colts came into service they began to be appreciated, and still bear the ascendency, while the Quicksilvers are nearly forgotten. The Quicksilvers, however, were handsome, docile and sprightly, but generally lacked endurance, while the Messengers are of slow growth, heavy, often of bad disposition, but when matured, of uncommon powers of endurance and excellent roadsters. About 1830, a horse called the "Indian Chief," was brought to Augusta from Canada, by T. W. Gale. He was a small iron gray horse, was a racker, and possessed great speed and bottom. He died in 1844, at Vassalborough. Some of his stock were great trotters and famous for their strength, energy and powers of endurance.

The Messengers began to decline about 1835 or 1840 and descendents of the famous Morgan horse stood in the county, leaving some good stock.

Between the years of 1840 and 1850, but little interest comparatively was manifested in the breeding of horses in this county or State. Farmers themselves paid no attention to breeding from the best animals, and our horses had not then the reputation they have since obtained and which has been acquired through the efforts of a few liberal minded and intelligent gentlemen, who were satisfied our State could produce as good horses as any other section of the country, and who have since proved this to be true.

The most important importation of stock horses into this county, was made by Thomas S. Lang, Esq., of North Vassalborough, in 1858. This comprised "Gen. Knox," foaled in 1855, by Sherman Black Hawk or the North Horse (now owned by David Averill, Westbrook) dam by Hambletonian, grand-dam by Hambletonian, and was bought of Demy & Bush, Shoreham, Vt. "Telegraph" of the Black Hawk strain of blood, foaled in 1855, and purchased of Mr. Baldwin of Ticonderoga, New York. He stood in this county three years, was sold in May, 1861, to R. S. Demy of Clappville, Massachusetts, and was burned at the Riverside Park,

1864. "General Morgan," bought of Demy & Bush, Shoreham, Vt., foaled in 1858, afterwards sold to go to Fryeburg, and now owned in Saco. "Sharon," afterwards sold to J. H. Ladd, Esq., and taken to Ohio, and "Bucephalus," afterwards sold to a gentleman in Dexter.

In 1860, Mr. Lang brought into this county the horse "Trenton." He was bought in Trenton, New Jersey, stood two years here, and becoming vicious was castrated.

"Gideon," by Rysdyk's Hambletonian, was brought into Vassalborough by Mr. Lang in 1865, and was afterwards sold to Foster S. Palmer of Portland, where he now is. This horse possesses the best descended blood of any animal brought into the State by Mr. Lang, but has as yet made no very remarkable time on the turf.

The most celebrated of the above horses, however, is the stallion "Gen. Knox," whose services as a stock horse have been more widely sought, and who is without doubt the getter of more fine, fast stock animals than any horse ever brought into this State. In 1864, at the first exhibition of the New England Agricultural Society, held at Springfield, Mass., he trotted three straight heats in 2.31½, 2.37 and 2.34½, making the first half mile on the first heat in 1.14, and the first half mile on the third heat in 1.15, beating "Draco Prince," and winning the distinction as the "Champion of New England," which he has ever since held. He was in very poor condition to trot at the time this race was made, having received no training, but on the contrary had covered mares to within twenty days of the time of the race, and could probably have made better time had it been required.

Among the most promising of the stock horses sired by "Gen. Knox," is one known as "Gilbreth's Knox colt," owned by J. H. Gilbreth of Kendall's Mills, Somerset county. His dam was of Messenger and Black Hawk blood. He is five years old, stands 15¾ hands high and weighs 1,080 pounds. At Waterville, in October, 1867, he made the half mile in 1.15.

In 1864, the horse "Don Juan," of Drew stock, was brought to Waterville, by Henry Taylor, Esq., where he has been kept to the present time.

George M. Robinson of Augusta, is perhaps the most extensive breeder of Drew stock in the county. The old Drew horse was foaled about 1845. His sire was a two-years old colt of whose blood nothing is known, and his dam was a trotting mare known

as the Landers mare, taken from Boston to Bangor, about 1840. She could trot under 2.40 and gave evidence of good breeding.* Among the animals now owned by Mr. Robinson, are "General Grant," 15¾ hands high, weighing 1,100 pounds, and a McClellan colt, three years old, sired by Gen. McClellan, a well known trotting stallion formerly owned by Mr. Robinson.

The old Drew horse lived until he was twenty-four years of age, and to every appearance was a young horse then. As is well known he was accidentally killed. Of the somewhat famous horses of this stock may be mentioned the following:—"Dirigo," "Gen. McClellan," "Hiram Drew," "Bacheller horse," "Cloudman," "Eastern Queen," "Little Fred," &c. The latter, a bay gelding seven years old and weighing 900 pounds, is said to have made 2.30 in private, and 2.31 in public.

The Knox and Drew stock may be considered as rivals in this county, and to a considerable extent throughout the State. Both have sincere admirers, and are alike represented by noble specimens of this noblest of animals. Each have also produced horses that have made good trotting time, but if a well sustained pedigree is of any value the Knox blood must always bear the palm.

The horse "Hendrick Hudson," a Hambletonian possessing a good pedigree and many fine points, owned by Capt. A. W. Calden, stood during the season of 1866 in Gardiner, and has doubtless left his impress upon many of the colts in that section who will hereafter give a good record for their ancestor.

In 1866, Mr. O. Whittier of Vienna, imported into the county several fine animals from the stud of Daniel McMillan, Esq., of Greene county, Ohio, one of the most noted breeders of that State. Among the animals purchased was a year old filley out of an Eclipse mare, a two years old filley out of a Bellefounder mare, a one year old stallion out of a Cadmus mare—all sired by Mr. R. A. Alexander's "Ben. Butler," conceded by all horsemen to be the finest thorough-bred horse in the State of Ohio. In addition to these, Mr. Whittier also purchased two mares of Bellefounder and Arabian stock, both in foal to "Ben. Butler."

For many kinds of farm labor, horses are fast taking the place of oxen, and have many advantages over them. They are quicker stepping, and for this reason are better adapted for work requiring considerable travel on the highway, as in teaming from place to

* Wallace's American Stud Book, Vol. I, p. 951.

place, &c. For hauling hay they are now used far more generally than oxen, and considering the rapidity with which they move, are at times, as in case of an approaching shower, to be preferred. In heavy plowing, such as breaking-up new land, they are found to perform good work, even upon land so rough that one would think it almost impossible for horses to work at all. I have witnessed the plowing of many such fields by horses, and the work was well done, and at much less expense than it could have been performed by oxen. For work in the lumber regions horses are fast superseding oxen, and it is now the exception rather than the rule to see ox-teams in the woods. With this change which has come about in the use of horses in place of oxen, comes also a complaint that our prevailing stock of horses is not heavy enough for the labor indicated above, especially for use in the lumber swamps during the winter. Horses weighing from 900 to 950 pounds are regarded as heavy enough for general farm work and riding, but for other purposes they are too light. The course of breeding into which we have run during the past four or five years, has developed the speed of horses, leaving other desirable and important qualities in the background.

This want of a heavier class of horses for performing hard work of the farm, road and logging swamp, induced Thomas S. Lang, Esq., of Vassalborough—who has done so much for the improvement of the stock and general agriculture of the county and State—to purchase, in 1855, the horse "Nickawa," which has ever since stood at his establishment. This animal has a pedigree that gives promise of some valuable stock, is sixteen hands high, weighs twelve hundred pounds, is of beautiful chestnut color and has good style. I feel confident Mr. Lang's efforts to improve our stock of work horses, will prove as successful as have been those put forth by him for the improvement of our trotters and roadsters, and are sure "Nickawa" will prove of great value to the county and State.

The farmers of Kennebec have never given so great attention to sheep husbandry as those in some other sections of the State, as their chief aim, so far as regards stock, has been the production of superior working oxen and fast trotting horses. However, while the majority of farmers have been intent upon other kinds of stock a few from quite early times have interested themselves in sheep and wool, and been instrumental in introducing some fine speimens

of the various breeds into this county. A few historical notes concerning these importations are given.

The Dishleys or Bakewell breed was first introduced into this State by the late Dr. Holmes of Winthrop (from the flock of Stephen Williams, Esq., of Northboro, Mass., who imported them from England) in 1828. About 1830, others of the same breed were brought into Hallowell by Charles Vaughan and Sanford Howard, and also in 1835 by R. H. Green of Winslow. Charles Vaughan, Esq., of Hallowell, obtained some pure Southdowns in 1834—they being the first brought into Maine. This gentleman, during his lifetime, devoted much attention to breeding these sheep, and also imported many directly from England. In his experiments he also endeavored to combine the Merino fleece with the Dishley carcass but was unsuccessful. As early as 1844 Dr. Holmes brought into Winthrop, from the flock of Messrs. Corning & Sotham of Albany, N. Y., a buck of the Cotswold breed, it being the first specimen of this noted breed introduced into Maine. About 1842, several farmers of this county purchased in Vermont a number of the "Vermont merinos" from the flock of Samuel Jewett, crossing them with their own flocks to much advantage. These sheep were entirely different from the improved American or Vermont merinos of the present day. As late as about 1840 specimens of the Otter or Creeper breed of sheep were bred in this county. They are described as of medium size, short legged, with a wide heavy tail, and were unable to jump.

There are at present very few full-blood merinos in the county, our farmers being more in favor of a breed that produces a larger carcass, as their contiguity to good markets for meat renders this, at present certainly, more of an object than the production of wool. Among these the buck "Green Mountain Boy," owned by E. Maxham of Waterville, obtained from Eben Bridge, Esq., of Pomfret, Vt., is one of the most noticeable. Mr. Maxham has also several full-blood ewes obtained from Mr. Bridge. Of farmers in the county engaged in breeding fine-woolled sheep, merinos and their grades, are C. S. Robbins of Winthrop, J. W. Manter of Readfield, J. Nye and N. R. Boutelle of Waterville, C. B. Cates and H. G. Abbott of Vassalborough, Seth Wentworth of China, C. K. Sawtelle of Sidney, and others. J. Percival of Waterville, and W. Percival of Vassalborough, are breeding Cotswolds; A. Lambard of Augusta, O. Whittier of Vienna, and S. G. Fogg of Readfield,

Southdowns. Some specimens of grade Dishleys are also occasionally met with in towns in the western portion of the county.

By the census of 1860, the number of sheep reported in the county was 43,550, and the number of pounds of wool produced, 140,802.

Nearly all the different breeds of swine propagated in the country have been at one time and another bred by the farmers of Kennebec county, and many breeds have been introduced here earlier than in other portions of the State, from which they have been disseminated to other counties. Long ago the "Newbury White" was a favorite breed, were kept pure for many years, but are now extinct. Then came the "Mackay" and the "Bedford" which continued in favor for some time. Following these were the Berkshire, and its different varieties, the Suffolks, and also the Essex in limited numbers. At present the Chester Whites and the Prince Alberts take the lead, and are both highly prized. The Chester is rightfully regarded as the best breed now kept in the country. They produce fine grained pork, are small boned, yield round, full hams, are prolific breeders and economical feeders. Although not kept to any great extent in the county, the animal is a very indispensable one upon the farm, as by his voracious appetite he converts into manure and at the same time into palatable and agreeable human food, many articles upon the farm which but for his agency would accumulate to an undesirable extent, and become detrimental to the economy and health of the household.

I regret to be unable to present any statistics in regard to the number of poultry kept in the county, or the annual value of their products. This branch of farm stock was considered of so small consequence that the Census Report of the United States does not mention it—but every farmer knows it is often the little things of his business that give the best returns, and surely the profits of poultry form no small item of the farmer's income. With eggs at twenty-five cents per dozen and dressed poultry at twenty cents per pound, there must be a considerable profit in this branch of farm stock. Some farmers in the county inform me that the manure from the poultry yard, if it is carefully saved and properly managed, will more than pay the cost and trouble of keeping, and this source of profit is one too generally overlooked.

CHAPTER III.

Fruit Culture—Management of Orchards.

The value of the orchard products of Kennebec county as given by the Census Report of 1860, was $77,054. But one other county in the State surpassed this, viz: Oxford, estimated at $84,465.

The apple orchards of the county are generally old, and until within a few years have been greatly neglected. The severe winters of 1856 and 1857 destroyed so many trees that it was some time before farmers and fruit growers recovered from the disappointment. But with the high price of fruit, and the return of more favorable seasons for fruit culture greater attention has been given to the orchards as a source of the most direct and remunerative profit that can come from the farm. Old orchards have in many instances, been pruned, manured, mulched and cared for, and very many new orchards have been started, some of which are already beginning to give very good returns. But notwithstanding this, I believe nine-tenths of trees in this county are actually starving for the want of something to feed upon. There is not thrift enough in the soil upon which they stand to enable them to grow and produce anything like a fair yield. I have seen the effects of this in many instances. In one orchard within my own observation, which changed hands three years ago, and which the man who sold it said was in a good bearing state and the soil rich enough, a most marked change was observable in three years, caused by a liberal application of manure to the surface, not only in the increased size but in the richer flavor of the fruit. In another instance, an orchardist informs me that fifteen years ago he set a tree where a large stone had been removed and the hole filled four or five feet deep with rich earth. The branches of the tree now extend twenty-six feet, the trunk is two feet and a half in circumference and produces annually from three to five barrels of greenings.

Orchards will bear to a great age if the trees are well cared for. There is one in the town of Chelsea, situated on the old Jones farm, near the river and opposite Brown's Island, which was set out before the revolution. It is upon a swell of clayey land, and the trees are now as healthy and produce as well as most orchards in the county.

To the Vaughans—those pioneers in the improvement of agriculture in the county—we are indebted for much of the interest

and success which has long been noticable in fruit growing in this section of the State. They imported many choice varieties of fruits from England, had one of the best fruit gardens in the State as early as 1798, and freely disseminated their trees and scions to all parts of the State, but more especially to those who would promise to take good care of them, and report to them the results of their culture. The interest thus excited by them had much to do with the progress and success of fruit culture in this county and the State.

I just stated that many new orchards have, during the past few years been set out in the county. The statistics I have obtained in regard to this point, are very incomplete, but still satisfactory and reliable so far as they go. There are several small nurseries in the county which supply a considerable number of trees to farmers in their immediate localities, and large numbers are also obtained from the nurseries at Saco, Westbrook and other places. The statistics I have obtained are from the books of Chase Brothers of Sidney, in this county, who inform me that in 1865, they furnished parties in this county with 5,595 apple trees, 580 pear trees, 47 cherry trees, and 100 grape vines. In 1866, 14,240 apple trees, 2,030 pear trees, 112 cherry trees, and 296 grape vines. In 1867, 13,785 apple trees, 1,650 pear trees, 60 cherry trees, and 167 grape vines. Their orders now on hand for the season of 1868, are nearly double those of 1867. These trees are from the Rochester, N. Y., nurseries, and if but half of them succeed, a very large increase in the fruit crop of the county may be reasonably expected within the next dozen years.

Instances of success in fruit culture in the county are so numerous, and many who have given attention to the renovation of old orchards have had such satisfactory results that it is no easy task to select from the number the most interesting cases, those which may be regarded as representatives of what so many in all parts of the county are doing. However, I have selected from the many that have come under my personal observation, two instances of remarkable success in fruit culture, one from the western, the other from the eastern side of the river. They are all for which I feel that I have room in this chapter.

Jacob Pope of Manchester, has an orchard situated on a rocky hill inclining south, with the sides sloping east and west. There are sixteen acres now covered with trees. The orchard was commenced thirty-six years ago by setting fifty trees; the last were

set two years ago. Those set in 1861, from seed sown in 1856, are now bearing. The land looks rather forbidding for ordinary farming purposes, being so rocky that the larger portion has never been plowed, but being well adapted to sheep grazing it is used for that purpose. The trees were mostly raised on the farm and set when four or five years old, and grafted after growing one or two years in the orchard, with Baldwins, Roxbury Russets and Rhode Island Greenings. The trees are strong, smooth and well trimmed, branching out about four feet from the ground. Three stakes driven around each tree guards it against the sheep. In 1856, Mr. Pope sold from this orchard 250 barrels of first quality apples at $4 to $4.50 per barrel, thus harvesting over $1,000 from a rough, untilled sixteen-acre lot, with a good prospect for many more in coming years. The superiority of this orchard and its fruit over many others in as good or even more favorable locations may be summed up in a few words; the best seedling trees are selected in the nursery; are well mulched when set; are washed with whale oil soap; the borers are hunted each season so sharply that they rarely damage the trees; the mulching is continued from year to year, if possible on a liberal scale—nearly one ton of meadow hay being applied to twelve trees—when large, extending quite as far as the branches, and leaving the soil so mellow that the roots have abundance of feed near the surface. He thinks the trees do better when set on the natural soil and mulched, than where plowed around and cultivated—two acres having received this latter treatment a few years since. The Baldwin seems to be perfectly at home in this orchard, bearing better and longer than the Rhode Island Greening.

In the summer of 1865, I visited the orchard of Mr. Joseph H. Smiley of Vassalborough, and intended to give from my own examination some account of what is known to be one of the best, if not the very best and most productive orchard of its extent in the county. But at the same time I requested the owner to furnish me with some account of its history and his method of management. This he shortly afterwards did, and I present here his own statement, which is far better than any account of my own would be:

"Dear Sir:—The land on which my orchard now stands was formerly a pasture. In the spring of 1848, I broke it up, planting it with corn and potatoes, applying a light dressing of manure. The following spring I measured the distances for the trees, namely,

twenty-four feet, and dug the holes to receive them. In setting the trees I reversed the earth, putting the surface earth at the bottom, and planted the trees two to three inches deeper than they were in the nursery. After having planted them I applied a liberal mulching of strawy manure around each tree, and supported such trees as needed it with stakes, taking care not to injure the bark. The trees I obtained from the homestead, I having assisted in planting the seeds and raising them. In removing them to the orchard I took up a few at a time, and I scarcely ever lost a tree by transplanting. When small it is very necessary that they should be protected against mice.. For this purpose my practice has been to make a small mound of earth around each tree in the fall, removing it in spring, or a good plan is to take the tea chest lead cut in strips and put around the trunk of each tree. A small portion of the trees were budded in the nursery, a few grafted at the root, but the larger part were natives. In grafting them, I selected the scions from trees that bore large fine fruit and grafted principally to Baldwins, Greenings and Tallmans, with a few trees of other varieties. My experience has been that the Tallman should be grafted at the ground as it insures a hardy trunk ; the Baldwin in the limbs, as it is rather tender, but a valuable variety. The Greening will do well either way. In grafting it is necessary that the tree and scion are both in a thrifty condition to insure success.

The orchard was planted and sowed to grain alternately for six or seven years (care being taken that the grain should not grow near the tree by frequent hoeing) and then seeded to clover. Since then it has been pastured with sheep. Before turning in the sheep I protected the trees by setting three small stakes around each tree and lathing up the space with pieces two feet long. About eight laths to each tree will answer. If of good thickness they will last as long as it is necessary for them to remain. Since it has been in pasture I have not allowed any grass to grow within three or four feet of the trees. To do this I have used a light grub hoe, using care not to disturb the roots. It is also necessary that the space should be hoed once or twice in the season as the continual tramping of sheep around the tree is injurious without an occasional stirring of the soil. For dressing I have a compost of muck and animal manure spread on late in the fall or early in the spring, evenly over the whole ground. When the trees were small I pruned them so that they should be nearly of a uniform

height, having them branch rather low, and I find many advantages in so doing: first, they are not so much exposed to high winds; secondly, it is not more than half the labor to harvest the apples, as a great portion of them can be picked by standing on the ground. June is undoubtedly the best month for pruning, but I have always pruned very lightly, believing from observation that heavy pruning is injurious to the tree.

The main orchard contains 125 trees planted on $1\frac{3}{8}$ acres of land. Besides this I have another very small one containing about $\frac{1}{4}$ of an acre, planted since the other. About 140 of these trees have borne fruit for quite a number of years. The remainder are just commencing to bear. The question arises, will all this trouble and expense pay? I think it will, and in order to make it appear so, I will give an account of the sales from it for the last four years, not with a view to excel, as I think very likely others have succeeded far better than I have, but merely to show that the apple tree with proper care will make liberal returns:

1863.	100 bbls. at $2.50 per bbl.,	$250 00		
	6 " 2.75 "	16 50		
			$266	50
1864.	50 bbls. at $3.25 per bbl.,		162	50
1865.	96 " 6.00 "	576 00		
	4 " 7.00 "	28 00		
	4 No. 2, 3.00 "	12 00		
			616	00
1866.	152 bbls. at $4.15 per bbl.,	630 80		
	6 " 4.50 "	27 00		
	2 " 5.00 "	10 00		
			667	80

Besides this I have kept from 6 to 8 barrels of number one each year for my family use.

The main cause of so much failure in the apple crop in this section is the lack of food applied to the trees. Some seem to lay great stress upon scraping their trees. I would as soon think of improving the condition of a horse by currying without feed as I would of improving a tree on an exhausted soil by scraping without applying some fertilizer to its roots. Let the tree be enriched, and nature has provided a way to rid it of the outer bark with but little assistance. Another objection by some is, if the tree bear bountifully it will not last as long. Supposing this to be the case,

(which I very much doubt) is it not better to realize a given amount in twenty years than to be forty about it? But I have no fears of this if the trees are properly fed while bearing. Some few of my Baldwins that were budded in the nursery, show some signs of early decay, but nearly all of the trees are in a healthy condition."

Nathan Foster, Esq., of Gardiner, a veteran nurseryman and fruit grower, furnishes me the following list of apples and pears for general cultivation in this county:

Apples:	Red Astrachan,	*Pears:*	Doyenne d'Ete,
	Sidney Sweet,		Rostiezer,
	Moses Wood,		Beurre d'Amalis,
	Am. Summer Pearmain,		Flemish Beauty,
	Winthrop Greening,		Nickerson,
	Somerset,		Fulton,
	Gravenstein,		Nouveau Poiteau,
	Holmes Sweet,		Belle Lucrative,
	Fameuse,		Urbaniste,
	Tallman Sweet,		Winter Nelis,
	R. I. Greening,		Lawrence.
	Bellflower,		
	Northern Spy.		

The fruit growers of this county have produced many varieties of fruits which have obtained more than a local distinction. Among these are the "Moses Wood" apple, a native of Winthrop, an early fall fruit of which Mr. Goodale says: "Were there not so many fine apples in eating at the same season, it would deserve distinguished praise";—the "Winthrop Greening," one of the most popular apples in the county, which Thomas in his American Fruit Culturist calls "a valued sort;"—the "Fairbanks" apple, which originated in Winthrop, an autumn sub-acid variety of much worth;—"Nelson's Favorite," a sort first grown by Ichabod Howe of Winthrop;—"Foster's Russet;"—the "Carlton" apple, a choice variety on its original stock, but which does not transmit its qualities if grafted, and other sorts. Among pears, the "Nickerson," which originated on the farm of Mr. H. Nickerson in Readfield, already takes high rank, and confers honor on the locality that produced it. Mr. Goodale in his report for 1863, says of it: "Young trees show vigorous growth and fine form, and the evidence of sufficient hardiness and productiveness seems conclusive."

A somewhat remarkable instance illustrating the influence of

soil and location upon the growth and character of fruit, is given by Mr. Goodale in one of his reports to the State Board of Agriculture, as occurring in this county. Here is a formation of pyritiferous slate extending from Monmouth through Winthrop and Sidney to West Waterville. In some places the rock is so largely charged with sulphuret of iron, that copperas has been made from it. The soil, of course, partakes of the nature of the rock, which, it may be observed, decomposes more rapidly than many others. This ridge of land is remarkable for the ease and abundance with which the Roxbury Russet apple is grown upon it, and also for the size, fairness and excellence of the fruit. Although the trees are not often overloaded, they bear well and regularly, every year, so that, taking a series of years, more bushels are obtained of this Russet, than could be from the Baldwin or from any other sort. Large orchards are to be found in this locality, consisting almost entirely of this variety, which, as may well be supposed under the circumstances, is found to be the most profitable for extensive culture. On either side, and even within a short distance of this ridge overlying the copperas rock, it is not so, and other varieties are more productive and profitable than the Russet. Of this Mr. Goodale remarks: "Cases so clearly marked, and distinctly defined, as the above, are not frequent, but something like it is by no means uncommon in many sections, and a study of the facts, in any given location, before deciding what sorts to grow most extensively, will be likely to lead to important and valuable results."

Another fact of a singular nature is, that the Messrs. Vaughan on their grounds at Hallowell, were almost always successful in growing peaches, and raised them to perfection. Indeed, at a much later period fruit growers in that town, among them Mr. H. F. Wingate, raised peaches year after year, and regarded them almost as sure as apples. When it is well known that a temperature of 20° below zero will kill the peach tree, and that we often have weather much colder than this, it is certainly not a little remarkable that so tender a fruit was formerly raised successfully in this northern county.

I give place here to the following excellent and practical article on "Orchards in Kennebec County," from the pen of S. N. Taber of Vassalboro', than whom no person is better fitted to speak from actual observation of the fruit trees in the county, as well as from a thorough personal knowledge of their methods of culture and management:

"If asked which are the best varieties of fruit to cultivate in this county, I should say those which have succeeded best for ten years past, and if there are any which have given better returns than the Rhode Island Greening, Baldwin, and Talman Sweet among winter fruit, (for a succession of years,) try them. If the object is to grow fruit for the market, do not try too many kinds. If for home consumption, have a succession of the best varieties for the dessert and cooking. Many of our native sorts, or those which originated in this State, are better adapted to our soil and climate than fancy sorts from abroad. Among the natives which should be more generally cultivated is the 'Starkey apple,' the original tree is I think yet growing on the farm of J. W. Starkey near 'Oak Grove,' Vassalborough. Tree very hardy; strong grower, and productive. Fruit fair, flattish-round, striped with pale red; flesh white, firm and crisp, somewhat resembling the Gravenstein. Season from November to January. It commands the first price in market wherever it is known.

Were I now to select varieties for a good family orchard I would have it include nearly the following varieties, or as many of them as convenient:

Early Harvest,	Hurlburt,
Early Sweet Bough,	Franklin Sweet,
Sopsavine,	Sawyer Sweet,
Williams' Favorite,	R. I. Greening,
Gravenstein,	Baldwin,
Somerset,	Northern Spy,
Porter,	Tallman Sweet,
Queening,	Bellflower,
Starkey Apple,	Golden Russet.

Does orcharding in Kennebec county generally pay as well for the amount invested, as other branches of farming? Yes, with rightly directed labor, on a soil adapted to fruit growing, it *will pay*, and richly too; but to say that a majority of orchards in the county do pay large dividends, would be hazarding too much. Our farmers are an impatient people; must clear up the land and put in such crops as will pay next year. They can't stop to set an orchard, as they may sell or swap the farm in a year or two; and if the father neglects to set trees and make home attractive, how can we expect the son to do better? When we cultivate a love for the beautiful in Nature, we shall certainly love to rear beautiful orchards, and our children will look on the 'old home,'

dotted over with fruit trees, as the choicest spot on earth. Some have not faith enough to set out orchards now, for 'fruit trees generally have been failing so of late,' that they seem to think they will never more flourish as in former times. But have we not seen repeated failures in the wheat, potato and other crops? The failure of a favorite crop often shows us its real value and the enjoyment derived from it.

In giving the present condition of orchards as compared with former years, we will go back about twenty-five years, when the orchards planted by the first settlers, on a fresh strong soil, were generally in a healthy condition, giving good crops, mostly natural fruit. Then apples were grown more for cider than for the market. In a few years temperance societies began to make cider rather unpopular as a beverage, the orchards were valued less, some neglected, some cut down, others grafted. Some small nurseries were established, into which new or popular varieties were grafted or budded. A demand was soon made for grafted trees, but owing to our severe winters, with deep snows, trees could not be raised so cheaply here as farther west, where nurseries were on a large scale and the climate more favorable. Large quantities of fine looking trees have been brought into this county from New York State; some were well cared for and a few have produced fruit, but probably not over one-tenth will ever pay the cost and expense of setting. They had grown too rapidly in the nurseries and were too tender for this climate. The severe winters of 1856 and 1857, so destructive not only to fruit but shade and even forest trees in some localities, gave young orchards, especially grafted trees, such a shock that those which survived looked poorly for some years. In many instances the graft was entirely spoiled, so that it was necessary to form a new top. With this draw back, just when farmers were becoming aroused and realizing the value of good fruit, a lull succeeded, nurseries were neglected and but few trees set. But for five or six years past there has been increasing attention to and a real zeal for orchards. Instead of setting grafted trees as formerly, the demand is mostly for natural trees, experience having proved that they will make more hardy orchards than those which are worked when small in the nurseries.

Pear orchards are seldom seen in this county. Why are there not more trees set when the crop is more certain in good localities than the apple? I have one tree in my apple orchard which has

been set some twenty-five years and has borne better and paid better for five years past than any apple tree on the place. I am aware the tree is rather more tender and difficult to transplant while young than the apple, but when well established, we have varieties enough which are perfectly hardy, and by proper training one need not think he is 'planting for his heirs.' Perhaps the Flemish Beauty will make good returns as soon as any variety.

The failure of the plum and cherry a few years ago has left quite a void among the choice fruits, but for four years past those trees which were not diseased have seemed to rejuvenate and have produced good yields. The early decay of stone fruit with us I attribute largely to the practice of setting sprouts instead of planting the stones from vigorous trees. The 'Horse Plum' makes the best stock for engrafting the plum. I find the Lombard and Nota Bena two of the most hardy and profitable varieties to cultivate for the market, as I have never found them injured with the black wart. Among my grapes I find the Concord and Delaware the most certain to ripen, but the Isabella is the most profitable.

In giving my views on the management of orchards, I shall commence back with the seed, and I earnestly recommend to all who can to have a *home nursery.* Select the seed from fair apples grown on vigorous trees if you can (the same will apply to stone and other fruits) if not get pomace at the cider mill, wash out the seed and sow immediately in drills, about one foot apart, on a gravelly or strong loam, pretty free from clay and in good order. The land may be dressed and managed similar to a carrot field. At the end of one year's growth the trees should be from one foot to eighteen inches high. The following spring select the strongest and set in rows about three and a half feet apart, eighteen inches in the rows. If convenient, the cultivator may be carefully run between them. Keep the land clean, top dress with well composted manure (leached ashes are an excellent ingredient,) prune carefully but sparingly every year, so that in about four years you will have a strong trunk and well balanced top, starting out four or five feet from the ground. Now select the best of these, take them up carefully so as not to mangle or strain the roots, and transfer to your orchard ground early in the spring, where the holes should have been dug in the fall, the earth having been piled up on one side of the hole and rich soil or compost on another—all will then be mellow and in good working order. Set the trees carefully (remembering they are plants and not posts) twenty-five

to thirty feet apart, having regard to soil and varieties. They may be set one inch deeper than their natural growth, mulched with straw from the barn yard, and grafted in two years from setting. The location for an orchard I would prefer to be on the gentle slope of a hill facing the southwest. The most desirable soil is a strong, naturally moist and rocky one. A retentive soil, or one that will not suffer from either drought or excessive moisture, and where the land will not 'heave' from freezing, will give a more regular growth and consequently the fruit will be less liable to fail. A very dry or wet soil not well drained, or a clayey soil, should be avoided.

Pruning is a part of the management of orchards that is too often neglected or unskilfully done. We often see trees where a part of the top is *hacked* off; perhaps the best bearing branches were 'too low to drive a team under,' or the cattle would 'brouse' and pick the fruit, and the tree must be run up out of the way. Again, it is not uncommon to see naturally vigorous trees left to twine their branches and sprouts until the tops would make a very strong brush or hedge fence. If there should chance to be any good fruit on such trees it is rather a perilous job to get it. I have found from observation and fifteen years' experience, that the best season generally for pruning is that recommended by Downing, 'A fortnight before mid-summer.' I would commence then and continue through the growing season. The training of trees, like the training of our children, should be commenced in their tender age. With a good 'bump of order' and a strong jackknife, one will soon learn how to keep a young tree well balanced; and while exercising his skill in training, he will be cultivating such a taste for symmetrical proportions, that an out-of-place shoot will be quickly seen and nipped. A little pruning annually is far better than a heavy one occasionally. Heavy pruning should be avoided in most cases, as it almost invariably hastens decay, but there are instances where trees have been sadly neglected, producing brush, but not fruit. Where a large branch is decaying, or a forked tree is liable to split down, then the saw must be used freely. In such a case the wound should be well coated with grafting wax, or something to exclude sun and wet. I know of an instance where a Golden Russet failed, the branches dying off after they have borne heavy crops nearly twenty years. These branches have all been sawed off twice and a new top formed, since which it has borne over fifteen bushels of apples in a season. I have a Bellflower which seemed to be fail-

ing rapidly three years ago. I cut out a large portion of unhealthy wood, leaving the most vigorous branches, and it now looks many years younger and is bearing well. Some varieties are so inclined to *run up*, forming a thick top, that there is hardly room to get into them, or the fruit to get room and sunshine; these must be thinned out or spread artificially when small. If such varieties must be propagated, it is better to graft them on spreading trees, and the reverse with spreading varieties. Avoid all forked trees for setting, as they are liable to split down, are not rightly formed for bearers. Sometimes a young tree will from accident be one-sided or not balanced; this may be easily remedied by shortening in the growing side so as to induce shoots on the blank side.

There is a diversity of views relating to manuring, tilling or cropping orchards. I would keep the land in good condition, so as to get a regular healthy growth on the trees. In a young orchard if the grass and weeds can be kept down under the branches as fast as they extend, by digging, it is quite as well as to plow and crop; but if this is not done, plow carefully so as not to disturb many roots; if heavy crops are expected, dress heavily with well composted manure, and apply a peck of leached ashes, or less unleached, to a tree. If it is an object with the orchardist to get as quick returns as possible from his trees, he must drive them, and of course they will be short lived, but productive. For a permanent and well-paying orchard, perhaps there is no better mode of management than to pasture with hogs, after protecting trees so they will not bark them. The practice of setting trees in single rows by the roadside, or along by permanent fences, seems to be gaining in favor, and are paying better,—having more sunshine and *better feed* than those in thick orchards. There are many nooks over some broken farms where fruit trees might be made to flourish and look much more attractive than the branches of bushes, piles of stones or rubbish, that are generally seen. If such spots are too wet or hard, it will sometimes pay to haul a load of rich soil for each tree. It will surely pay to mulch young trees with straw, corn-butts, potato tops, or the like, especially when growing on grass land. Use enough of the above material which has been well soaked in the barn or hog-yard, to kill the grass in a circle of six feet diameter.

Will not orcharding or fruit-growing be overdone in a few years? is a question sometimes asked by those who see their neighbors setting trees pretty liberally. I think it would be safe to say that

if five times the amount of good fruit was raised in Maine or in this county, that has been raised in past seasons, it would readily sell at prices which would pay as well as other crops. The demand for good apples is rapidly increasing, and we now find them commanding the highest prices where they seem to be the most plenty. Purchasers prefer sending out or looking them up where they are more abundant. Our population is increasing, while the newly planted orchards hardly keep pace with the decay of old ones. Indeed, it looks as if there was now much to encourage us to set more trees, and take better care of them; but let us be careful and not set faster than we can care well for,—bearing in mind that ten good trees are worth more than one hundred neglected ones. To all who have a good chance but have not improved it, I would say, plant *good* trees and take good care of them."

The culture of pears, plums, grapes and the small fruits has increased very much within the county during the past dozen years. Nor is the culture of these fruits confined to those living in villages and possessing but a small spot of ground; it has extended over the entire county, and the gardens of farmers are somewhat rare where grape vines, plum trees and a strawberry bed are not to be found. These are not only a source of pleasure and luxury to the farmers and their families, but often made a means of profit. Mr. John Goode of Hallowell, from one grape vine, has sold $20 of grapes annually for some years. In 1864, Samuel Austin of West Gardiner, sold $50 worth of Isabella grapes from a single vine. Other cultivators in different parts of the county show results equally as satisfactory.

Mr. Nathan Foster of Gardiner, who has spent a long and active life among fruit trees, is in the constant habit of transplanting them at any time of the year when it can be attended to. Out of seventy-two trees set in the month of June, in one year,—the trees having been removed in dull weather—the leaves of but two wilted at all. He also practices grafting at any time of the year he has occasion to perform the operation, and out of more than seven thousand grafts set, but a very small number have failed. The scions he prefers to have cut in April. His method of grafting is that known as saddle grafting, and he uses a wax made of four parts rosin, two parts beeswax, and one part tallow. With this narrow strips of cotton cloth are saturated, and when hot they are applied or wound round the place of inserting the graft.

An experienced orchardist in the eastern part of the county tells

me that in grafting young trees the second year after setting, he prefers grafting a part at a time, say one third of the trees in the orchard each year for three years. It has many advantages in its favor.

In some towns a very handy and serviceable method of training or forming a desirable shaped top upon upright trees is practiced. It consists of taking lathes, or if needed strips of boards longer than lathes, attaching a strong string near each end, leaving a space long enough to spread the branches the desired space, confine the stick to the branches at each end by means of the string and allowing it to remain until the proper shape or position of the branches will remain in place of themselves.

The best fruit grown, that for which a high price is expected and realized, is all picked by hand from the trees. This at first seems a rather slow process, but one expert at the work will perform it quite rapidly, and the increased price for which the fruit sells more than repays the expense of hand picking.

But little cider is now manufactured in the county, where formerly the orchard products were chiefly used for that purpose. This article commands $6 per barrel in this market.

Culture under glass is receiving considerable attention, although it is less than ten years since the first grapery was erected within the county. These are confined almost exclusively to villages and cities, and Hallowell, Augusta, Gardiner, Waterville, Readfield and Winthrop already show a goodly number.

I have one suggestion to make, and can insure a fortune from it (if put in practice) to any person who will carry it out with energy and fair business tact. It is this: The cities of Augusta, Hallowell and Gardiner, containing a united population of 15,000, and situated within six miles of each other, are all dependent upon a foreign market for their early vegetables and small fruits. It is true a few farmers make it a point to raise small quantities of early potatoes, green peas, &c., for these markets; but aside from this no early vegetables or fruits are grown for the markets of these places by any one who follows it as a business. The first string beans, green peas, corn, radish, cucumbers, asparagus, and small fruits offered here are generally the product of Massachusetts or New Jersey gardens, and those who purchase them, do so at enormous high prices, and often get inferior articles at that. The first cultivated strawberries in market sell as high as 60 cents per box, and other articles in proportion. Now is there any branch of

farming or gardening carried on within the county that promises better or safer returns than that of cultivating vegetables and the small fruits for the markets of these three cities? And who will be first to secure control of the business by at once engaging therein?

CHAPTER IV.

Cereal, Root and other Crops.

The grain crops in a grass growing section are a necessary evil—that is, with the present system of farm management in the county. Unless the top-dressing of grass lands is practiced, which it is not to any great extent with us, mowing fields "run out" to such a degree in a few years, that they require to be plowed up and re-seeded. The experience of the best farmers in the county is that at present, the grain crops do not yield a satisfactory profit for the cost of production, but in order to produce good crops of hay it is necessary to grow them occasionally for the purpose of laying down to grass. In this county all the grain crops are of secondary importance to the hay and fruit crops; but a few notes concerning the characteristics and product of each are deemed in place here.

For the following interesting remarks on wheat culture I am indebted to Rev. W. A. Drew of Augusta, well known as a writer upon agricultural subjects:

"Time was when wheat was a sure crop in Maine, and was raised without serious difficulty in quantities adequate to the wants of the people. This period was from the earliest interior settlement of the district down to about the second decade of the present century. We are not apprised, by any facts of agricultural history in our possession, that, before that time, there were any material failures of wheat husbandry. It was amongst the most common and reliable crops, especially in the Kennebec, Androscoggin and Sandy river valleys. Even later than the period mentioned, and within the memory of the writer, wheat was a surer crop than Indian corn then was, and more bushels of it were annually harvested and consumed. Barley and oats were hardly more abundant. The only flour brought into the State was borne hither in coasting vessels from Baltimore and Richmond, and this was seldom used except in small measure by families mostly in our seaport towns for pastry purposes. The Erie canal had not then opened western New York,—then regarded as the far west,—and 'Genesse

flour' was unknown here. For wheaten bread, therefore, the mass of population had to rely upon the home article, and this, for years, supplied the general demand. The village stores had their ample bins for wheat, which constituted a principal article of trade in exchange for groceries and dry goods. Few stores were without their neatly constructed flour and meal chests from which were retailed the bolted element of 'white bread.' It was not, however, 'white' like the present XXX brands of St. Louis. It was sweet and nutritious, but of brownish hue. This may have been owing to the kind of wheat then in cultivation, or to the imperfect bolting. We had no good flour mills then. Much of the bran was mingled with the flour.

In those days, we well remember, country traders, who took in wheat during winter, moved their surplus stores on sleds and pungs to the commercial towns where larger merchants bought up the grain—sometimes for shipment 'all along shore,' as food for the inhabitants of other New England States. Hallowell was the great depot for the reception of the country produce brought thither from what are now the counties of Kennebec, Androscoggin, Oxford, Franklin and Somerset, and parts of Sagadahoc, Lincoln and Waldo. At the Hallowell Cross Roads, now Manchester Forks, we have seen, when the sleighing was good in the winters of 1814, '15, '16 and '17, whole lines of teams and pungs, like an unbroken procession, moving into Hallowell, laden with wheat and other farm products; and we have known more than one spring when vessels at the wharves of that busy town were freighted principally with wheat for a distant market.

Perhaps the success in wheat raising, down to the period we have indicated, was greatly owing to the fact, that the country was comparatively new; the grounds had not long been cleared of their primeval forests, and much of the grain was raised on burnt land. The soil was in its virgin purity and certain mischievious insects had not yet followed the tide of civilization hither and commenced their depredations upon the luxuriant plants. It may be that this is a fair solution of the difficulties that subsequently arose—albeit experience has since shown that the newness of settlements and a virgin soil are not the indispensable conditions of success. On old grounds, in much later years, larger crops have been raised per acre, than were known to be reaped from burnt land. We could mention premiums awarded by the Kennebec Agricultural Society, for 40, 45 and 50 bushels of excellent wheat to the acre. Even

this present year (1867) the papers notice thirty bushels and six quarts raised on seven-eights of an acre in Phillips, by Mr. M. G. Walker. We know farmers who have occupied their lands forty years and have never bought a barrel of flour, but have always raised their own wheat in ample quantities for their family use. The report of the Agricultural Bureau at Washington shows that the average yield of wheat per acre in Maine, during the past ten years of discouragement, has been within one bushel and eight tenths of that in the new State of Wisconsin, which is regarded as one of the best wheat growing States of the great west.

The first misfortune that befel our wheat crop in Maine, was in the year 1810. The *smut* then appeared and made sad work with the unripe wheat heads. In large numbers of the heads the place of grain was occupied by a black powder, which, being light, caused them to stand perfectly erect over those that contained 'the full corn in the ear,' which were bowed down by their golden weight. The evil of smut in wheat continued for several years. Machines were constructed for cleaning the seed, which, in some cases, were successful; but the grain at best was tarnished.

The next misfortune was the Hessian fly. As the smut began to abate, these flies took possession, and rendered the crop very uncertain. For years, to about 1830, our farmers struggled, first with one and then the other of these pests, till both happily disappeared. But the precious grain was not thus long to be let alone. Another enemy was on its way. In 1832, the midge was heard of in the Connecticut valley. In 1833, this scourge had reached the White mountains of New Hampshire, and entered Bethel, in western Maine. In 1834, it made its appearance on the farms of the Androscoggin and Sandy rivers, and in 1835, entered the valley of the Kennebec. From that time to the present, it has prevailed more or less, although for the last three or four years the wheat crops have been but little injured, comparatively, by it. There is a periodicity to these evils, and it may be hoped, that, as the smut and Hessian flies have passed away, so we are soon to be delivered from the ravages of the wheat midge.

The first improvement on the original variety of wheat raised in Kennebec county, we think was the *Malaga*, introduced by the Kennebec Agricultural Society in 1822. This was a white grain and did well till, by careless intermixtures, it deteriorated and run out. Then followed the *Tea* wheat, and this was a success. After this came the Mediterranean, the Black Sea, the Lake wheat, and

other varieties. Now our spring wheats are as good as those of the west, and make as handsome flour. The main crops hitherto have been spring grain. In certain localities and seasons, winter wheat has succeded. It always ripens free from the midge, if it comes out of the winter alive. The blossoming is too early for the weevil or the rust. Taking all things into the account, we suspect that the hazards against the life of winter wheat, seasonably sown, are not so great as those against spring grain.

The best variety of winter wheat that has been cultivated in Maine, we must think, is that known as the *Banner* wheat. In 1844, we received a small package of this grain from the Patent Office, just imported from the Baltic. We sowed it, and its proceeds, till three years afterwards, a harvest of thirty-two bushels, sixteen for one, was obtained, when we distributed it in various parts of the State for cultivation. In many places, as uniformly with us, it proved a good success. Though Maine is not the most favorable region for winter grain, the Banner wheat has been raised more or less to this day. It is a splendid grain. Sowed on grounds that the frosts do not heave badly, it is found to survive the winter nearly as well as herdsgrass or clover. But it should be sown in August, that it may get firmly rooted before winter. If a grass field or pasture is plowed in July, fertilized and harrowed, and sown and rolled in August, or if the seed is scattered in the corn field previous to the last hoeing, the chance is quite sure of an early and ample harvest in July following.

There is a variety of spring wheat, nearly as handsome as the Banner wheat, brought from over sea into Palermo, Waldo county, five years ago, which has not failed of yielding a good crop, and has never been afflicted by the weevil. The seed of this grain should be widely disseminated.

Wheat sown upon high grounds, where the air draws over the growing grain, will not be troubled by the midges. They cannot deposit their eggs on heads that are in the least degree of motion. We know such elevations where the wheat crop has never failed. By selecting suitable soils in proper locations, and preparing the ground in autumn, so the seed may be sown whilst the frost is coming out in spring, we know of no reason why wheat may not be made as sure a crop as corn is. Maine ought not to spend her millions every year for western flour, when she can raise her own. The bounties paid by the State in 1838, stimulated the raising of wheat to the amount of 1,107,884 bushels,—equal to 221,575 bar-

rels of flour,—and it was money not lost but well paid out to our own people, and retained at home. It kept a vastly greater sum—no less than $1,551,025—from going out of the State, and we are not sure the policy might not be revived with great advantage to all concerned."

Indian corn is one of the safest crops grown and is perhaps more universally cultivated than any of the smaller grains. The census of 1860 reports 229,460 bushels as the product of this county. It requires a well drained soil in good condition to be produced in its perfection. The time of planting is from the 20th to the 25th of May, but it varies with the season, and has been several times within the past twenty-five years planted as late as the 13th of June, and occasionally as early as from the 10th to the 13th of May. The months of July and August, if warm, with seasonable showers, will generally insure a good yield of this crop, even if the remaining months are unfavorable. I have known some instances within the county where ripe, sound and well filled corn has been harvested in ninety days from the time of planting, and considering the liability to early and late frosts which many localities in the county experience, it seems to me that all our farmers should endeavor to plant a variety that will mature in at least three months. It is usually sown on sward ground broken up in the fall, although spring plowing is practiced by some farmers. The rows are $3\frac{1}{2}$ feet apart, and the hills about two and a half feet apart in the row, and while five or six grains are put in each hill, but four are allowed to remain, the other stalks, if they escape the ravages of the cut worm, being removed at the last hoeing. Several machines for corn planting have been invented, but they have never come into very general use, while some are quite impracticable.

Much of the cultivation of this crop is now performed by the horse hoe, but where this is not done, two hand hoeings are given to the crop, the last of which takes place about the last of June. After this nothing is done to the crop until it is harvested. The general practice with our farmers is to cut the stalks at the ground, bind into small bundles, and have four of these bundles made into a stook or shock in which situation it remains in the field until the stalks are thoroughly cured and the corn ready to be husked. Beans were formerly almost invariably planted with corn, but of late years this practice is not so much followed. The stalks are justly regarded as of much value for forage, and are fed out chiefly to the neat stock, although horses and sheep are extremely fond of

them when well cured. For milch cows they are considered of as much value, bulk for bulk, as the best of hay, as they increase the flow of milk and keep the animals in the best condition.

By consulting the reports of the various agricultural societies in the county, I find the premiums awarded for crops of Indian corn during the past eight or ten years. These range about as follows: Fifty-one bushels, fifty-eight bushels, sixty-five bushels, seventy bushels, the highest being eighty-seven bushels of shelled corn to the acre. During the years 1856 to 1860, I find the cost of producing a bushel of corn to be about forty-five cents; since that time it is safe to estimate it as at least double that amount.

Indian corn is comparatively a very healthy crop. In some localities it is effected by a dark spongy fungus growth known as smut, but this has never to any great extent been found in our corn fields. There exists great uncertainty as to the cause of this malady, and I am not aware of any known preventive or remedy. In the western section of the State the rust on corn has showed itself to an alarming extent during the past year or two, in some instances entire fields being almost totally destroyed. Let us hope it may not extend. The insects most destructive to this plant are cut worms, the larvæ of different species of *Argotis*. Five varieties have been named and described, and Dr. Fitch has given his views that neither the fertility of the soil or the kind of manures applied have any influence on these worms, except as they make the plants grow more succulent, and therefore more palatable to them. The only sure remedy is found in digging them out and destroying them. In some parts of New York and Pennsylvania, a new enemy to young corn has made its appearance within the past year or two. It is known as the Hunter weevil, (*Sphenophorus venatus*, Say) and eats the leaves of the young plant to such an extent as to materially injure the crop. I trust our own State is not to suffer from its visitation.

The county produced in 1859, 565,304 bushels of potatoes. Since that time their culture has been much extended, but I have no reliable returns upon which to base an estimate of the amount produced in any one year since that time. The yield this year, 1867, is however, somewhat below an average on account of the unfavorable season. The spring was late, consequently they were late planted, and the rust coming upon them during the latter part of August caused a very serious diminution of the product. Within the past dozen years a great number of seedling potatoes have

been produced, and it is now almost impossible to find cultivated any of the sorts commonly grown a few years since. Many new varieties have been grown by our farmers, the most popular of which are the Early Goodrich, Gleason, Early Sebec, Jacksons and some other sorts. On account of the rust and rot it is desirable to plant an early maturing variety, that will escape this disease, and these are found to satisfaction in the early Goodrich and early Sebec seedlings.

It now seems to be a well defined fact that the rust upon the tops of potatoes proceeds from a *spore* of very minute size which germinates upon the surface of the leaf. The multiplication of the spores upon the leaves depends much upon the condition of the weather and soil, a warm moist atmosphere and a wet soil, being favorable to their re-production. With these conditions the blight rapidly extends, the leaves die and the entire stalk becomes blighted. Some of these spores fall to the ground, are carried through the soil by water and lodge on the tuber where they germinate, thus causing it to rot. Experiments have demonstrated that perfectly healthy potatoes may be made to rot by sowing the spores upon the leaves, or even upon the tuber itself. I am not aware that we possess any cure for this disease, or that scientific investigation has suggested any, as there is no means of economically killing the fungus without destroying or injuring the tuber; but among the means which Prof. Brewer of the Sheffield Scientific School of Yale College,—who has devoted much time to a study of the nature and habits of this disease—has suggested whereby the former may check its ravages are the following:

1. Thorough drainage of the soil lessens the liability of the leaves to be attacked by the fungus, as blight, rust, mold and mildew are found to spread much faster on wet, than on dry land.

2. Plant only sound potatoes, for every diseased potato is a source of fresh fungi.

3. Either plant deep, or else hill up the potato very high, early during the growth. It is often found that tubers lying near the surface decay, while those that lie deeper escape. The reason is obvious. The spores from the surface do not reach those deeper buried so easily as they do those near the surface. This is one of the most valuable of the proposed remedies, and agrees with experience.

4. Mowing off the tops of the potatoes when the blight appears, has in many cases saved the tubers. In other cases it has failed,

because a crop of spores has already fallen on the soil, to penetrate to the tubers. The removal of the tops from the field, or leaving them in the furrows, so that the spores from them would not wash down into the hills among the tubers, would lessen the liability to rot.

5. Certain English farmers recommend laying off the potato tops on either side, half right and half left, along the rows, and throwing dirt upon the ridge, over the stems and roots. They state that in this way a great saving is effected.

Barley is one of the most important grain crops cultivated by our farmers, and is almost invariably sown after corn to seed down with, and is, next to wheat, more highly esteemed for this purpose than any other grain crop grown. The average yield per acre is about thirty bushels, and the entire crop of the county may be safely stated at nearly five thousand bushels annually. The variety most generally sown is the four rowed, and three bushels of seed to the acre is regarded as a sufficient amount. Premiums have been awarded by our societies for forty-eight bushels produced upon an acre.

The culture of the cranberry has largely increased during the past few years and is already beginning to assume considerable importance among the agricultural products of the county. There are large tracts of land most admirably adapted to their growth within the county, and year by year it is being brought under cultivation. Belgrade, Sidney, Mt. Vernon, Readfield and Waterville are the towns in which the largest number are grown, although in other towns small bogs are being set out with them from which farmers are receiving good returns. A ready market for the fruit is found at the farmer's own door, and at prices that pay very large profits. In this city, during the present fall, 1867, four dollars per bushel has been the ruling price paid for the fruit. What crop raised at so little expense, gives so large a return?

The soil most natural to the cranberry is bog muck, of which the bogs in Sidney, Belgrade and Mt. Vernon are the best examples. Eastwood in his treatise says: "Dead sand, water and air are the elements upon which the cranberry feeds the best and attains its highest degree of perfection; therefore, that soil and location which has these advantages, is best adapted to the growth

of the berry." I will add a few essential points in regard to their culture and management.

The plants should be set about the 20th of May, after having eradicated all grass and weeds from the spot selected. Place them three and a half feet apart between the rows, and eighteen inches between the hills. At this distance they can be easily cultivated. The cranberry is liable to be injured by late spring frosts—while the vines are in blossom—usually from May 25th to June 4th. A fly also attacks the vines about the middle of July, depositing its egg in the berry. The larvæ of this fly is very destructive to the fruit. The bog should be so located that it can be flooded at the will of the cultivator. In winter the bog should be flooded to protect the ground from the severe action of the frosts, in late spring to check the growth of weeds and wild grasses, and in July to prevent the cranberry fly from depositing its eggs in the berry. At each season the retarding effects of the water on the plants are very slight. The best varieties are the Bell, Bugle and Cherry.

An average crop in good localities is from one hundred and fifty to two hundred bushels per acre, but in this county I think the crop will not average more than one hundred bushels to the acre. At four dollars per bushel any farmer can very quickly reckon up the profits for an acre or any less extent of ground. Hand picking is generally practiced throughout the county, and regarded best, as it does not injure the vines, and less berries are lost than by gathering them with a rake.

On the Dudley bog in Mt. Vernon from 50 to 100 bushels are raised annually. Benjamin Dudley and Samuel Porter are the owners of the bog. Some farmers in Vienna have also recently engaged in their culture, and are extending it year by year.

For the following statistics of the crop in Belgrade, Sidney and Waterville—these towns comprising the cranberry region of Kennebec county—I am indebted to Mr. D. E. Manter of Sidney. Of his own experience Mr. Manter writes: "I commenced by turfing three acres of an old meadow eight years ago, and set it to vines in rows about four feet apart, with the hills one foot apart. It was kept free from grass and weeds, and after three years, I set a row between each of those previously set. They seemed to do well until 1866 when the leaf worm commenced to eat them, and this year (1867) the crop is a failure for the first time The vines grow well, and last year looked very promising until about July 15th, and instead of 200 bushels as I expected I gathered but five."

Name.	Town.	Am't of land cultivated.	Largest yield.	Average yield.
Abner Pitts,	W. Waterville,	24 sq. rods,	12 bushels.	5 bushels.
D. E. Manter,	Sidney,	3 acres,	50 "	30 "
Wm. K. Damon,	"	4 sq. rods,	2 "	¾ "
D. S. Goodhue,	"	4 "	1 "	½ "
Abner Hammond,	"	50 acres,	275 "	120 "
William Wyman,	Belgrade,	100 "	200 "	100 "
Minot & Page,	"	100 "	150 "	100 "
Hartwell White,	"	30 "	–	30 "
Charles Stevens,	"	20 "	–	35 "
David Blake,	"	1 "	–	15 "
——— Alexander,	"	⅛ "	30 bushels.	–

No county in the State possesses superior advantages to Kennebec for growing cranberries, and in none, so far as I am acquainted, is more progress being made in the work or with better results. And yet, considerable as is the present yield of this crop, not a twentieth part of the land suitable for it in this county is under cultivation. Thousands of bushels might be raised at small expense, and there is no probability that the supply will exceed the demand. Let their culture extend, let the acres of waste bog land be set with this crop, and money will flow into our county from this now somewhat neglected source.

But two counties in the State grow more hops, annually, than Kennebec, although their culture is confined to two or three towns in the eastern section of the county. The product for 1859, was 2,382 pounds, which was only exceeded by the counties of Oxford and Franklin. During the past year or two their culture has been somewhat extended among us, and I think it safe to estimate the present year's crop at about three thousand pounds. Some farmers in Albion and China have made this crop a specialty in their operations, and have, amid all the fluctuations in its price, steadily adhered to its culture. Mr. Noah Jones of the latter town, who has one of the largest hop fields in the county, some five acres being devoted to this crop, is satisfied from an experience of over twenty years that it is the best paying branch of farming he has ever pursued. Among others engaged in the growing of hops in China, are Eli Jepson, John Varney and Isaiah Austin. Thomas Stevens of Albion, has a small field which he has cultivated with success for some years. He estimates the first cost of starting an acre of hops at $50, which will produce the second year about $25 worth of hops. After the second year an acre of hops will average about $200 per annum. Seven hundred pounds are re-

garded as an average yield per acre. The price of hops during the last fifteen years has ranged from three to fifty cents per pound, the average being thirty cents.

Of other crops grown within the county, the following summary statistics are given from the last United States Census:—Oats, 240,077 bushels; rye, 7,626 bushels; buckwheat, 4,099 bushels; peas and beans, 22,481 bushels.

CHAPTER V.

Some Representative Farms.

It was my intention when this survey was projected, to give a brief practical account of one farm in each town in the county, selecting for this purpose the farm best managed and most productive. But I find such a plan will be impossible as it would occupy more room than seems desirable, and I accordingly select from the large number of farms visited, accounts of a few located in different parts of the county, which must serve for the purpose of showing the general farm management in practice.

Oaklands—Gardiner.

The estate belonging to the late Hon. R. H. Gardiner is the most pretentious, and without doubt the finest country seat in the county, and as such is entitled to a somewhat extended notice.

"Oaklands" is situated in Gardiner, about one mile below the city, and commands a fine view of the Kennebec, along which it extends about a mile and a half, being bounded on the east by the river. The estate now contains five hundred acres—its original limits being much larger. The general slope of the land is east, south east, the average grade being about 150 feet to the mile. Its soil varies from the extremes of stiff clay to loose sand and gravel, but for the most part is a loam, inclining partly to the character of sandy, partly to that of a clay loam. The estate is probably one of the best wooded in the county, 350 acres being in woodland, the remaining in tillage and pasture. As soon as the wood in any portion not required for picturesque effect, is large enough to be merchantable, the entire growth is cut clean and allowed to grow up again. The plan of cutting out the larger trees was previously followed for many years, but abandoned as

not advantageous except in a few acres of white oak, from which trees are cut from time to time for ship timber.

The pasturage is restricted to ravines unfit for the plow, and occasionally a field for the first few years after being taken from the woods. Very great advantage has followed dividing the pasturage into three lots, and feeding them in rotation. In this way they furnish above 50 per cent. more forage than when fed at large.

I am informed that the cultivated land has been treated in every variety of way by the succession of farmers who have it in charge. A lesson clearly taught by experience is the advantage of deep plowing, and the crops found most profitable are grass and apples. The amount of hay cut on the farm is about one hundred tons annually, and the amount sold depends of course upon the season and the stock kept. In the year 1864 about fifty tons were sold.

The average amount and kind of stock kept may be stated as follows, viz: One pair of work horses, one or two yoke of oxen, from six to fifteen cows, a bull, several heifers, from four to six breeding sows, together with half a dozen shoats, &c. Sheep have never been kept to any great extent, and never more than thirty kept at any one time. Rev. Frederic Gardiner, to whom I am under great obligations for many favors, and who has had the management of the estate for several years, in a communication to me, says: "For cows in milk, oats cut when in the milk and cured like grass, were found of extraordinary value, especially in increasing the richness of the milk. It is, however, somewhat difficult to protect these oats from the mice. Wheat-bran—shorts—were always regularly fed to milch cows, and also, boiled with potatoes, to the hogs. The second crop of grass (rowan) was found valuable for increasing and keeping up the flow of milk in cows." In addition to the stock above mentioned it should be stated that three horses for family riding were usually kept at the house stable, and fed from the farm. I also give a portion of a communication from Mr. Gardiner which relates to the use of artificial manures upon the estate, when under his management:

"The plan followed during the years of my own management of the farm—I think little use was ever made of them before—was to ascertain from published chemical analyses the constituents of the crop to be raised. Then to calculate the amount of each element contained in the largest crop likely to be obtained, which amount was doubled and a compost prepared from such cheap material,

refuse from our manufactories, tanneries, &c., &c., as could be obtained, which should contain the same elements in the same proportions. It was thought that thus at least the land would not be exhausted by taking off the crop. The plan was especially successful on barley and on potatoes. On corn, only one experiment was made—on about three acres—which was an entire failure; I suppose because nothing was added to stimulate the corn in the early stage of its growth. These composts were applied broadcast and harrowed in. I am very sure I have laid away somewhere a quantity of tables of these various composts, but cannot lay my hand upon them. I remember that the cost of the barley compost, including labor and spreading, was about $7 per acre; and the additional yield on six acres in a year when the matter was tested amounted to $11 per acre. The effect on succeeding grass crops was also very marked, but never accurately measured. Saw dust was much used as the material for carbon; but it was found practically that much lime must be used with it to prevent the 'souring' of the ground by oxalic acid produced by its decomposition. Woollen rags, until the price rose too high, were found a most valuable manure. Saltpetre, nitrate of soda, sulphate of soda, and sulphate of magnesia, were all experimented with in quantities of from 200 to 600 pounds each—but without results corresponding to either their reputation or their cost. Coal tar was considerably used in the composts as a source of carbon. The ammoniacal liquor from the gas works was used altogether to the amount of some forty barrels, without any apparent result, except in a very small experiment in the garden where the effect was great. I am satisfied that this failure arose only from ignorance of the proper method of management and that under judicious application, this must be a valuable fertilizer. The refuse lime from the gas works was largely used for several years, sometimes with very marked beneficial effect, sometimes with none at all. It requires to be fully exposed to the air many months before being used, and then is chiefly converted into 'plaster.' It pays for hauling a mile or two, but requires so much labor that it is not worth more.

The use of refuse salt in quantity depends upon the crop. I should not care to apply more than from two to three bushels per acre to grass land. We used largely one and a half and two bushels salt mixed with the same quantity of plaster on grass with marked advantage. On oats a larger quantity per acre is needed. So far as I know, all crops are benefited by a small dose, and sev-

eral, as beets, carrots, &c., by a larger one. Leached ashes were only used on corn with any expectation of immediate benefit, and only such quantity as happened to be on hand was applied. An experiment was tried of 100 bushels on one acre of grass without visible effect either in that or subsequent years. This acre was a light soil. Unleached ashes were always treasured up and bought largely. They were considered valuable for everything and especially so for potatoes. I think we never had enough of them to use more than about 25 bushels to the acre.

Just as I was giving up the care of the farm the manufacture of a manure which can hardly be called artificial was begun at Wiscasset, by drying and grinding the common varieties of 'rockweed'—(*Fucus nodosus*, and *F. vesiculosus.*) From such experiments as I made with this, and from a chemical analysis I made of some samples, I am satisfied it will prove of very great value as a manure if generally introduced.

I believe however that artificial manures sold ready-made, are much more expensive than composts quite as efficient, manufactured at home."

The house upon the estate at "Oaklands" is one of the most massive and spacious private residences in the county, and in point of location or architecture has few equals in the State. The work of building was commenced in 1835, but was not completed until 1842. It was the first,* or one of the first works of Richard Upjohn, who has since become well known in connection with the architecture of New York. The house was erected at great cost, and although a fine specimen of architecture, is quite too expensive for the purposes of a New England farmer's home, and seems more the accompaniment of a royal title and its belongings, than the unostentatious abode of a simple farmer. While I have great faith in stone as a material for building, and wish it might be used to greater extent than it is, I believe houses of the extent of that at "Oaklands" cost more than even the wealthiest of farmers can judiciously expend in that way—however beautiful they are in themselves, and however much they contribute to the dignity of country life, and to the elevation of the character of American farmers.

* "The house, a splendid one, of the finest granite, is erected in the style of rural architecture which prevailed during the reigns of Henry VIII. and Elizabeth, and was finished at an expense of more than $32,000. Mr. Downing, in his Landscape Gardening and Rural Architecture, says: 'In Maine, the most remarkable seat, as respects landscape gardening and architecture, is that of Mr. Gardiner of Gardiner.' It is surpassed by few if any residences in New England, and the estate itself is most elegantly situated, and adorned with great taste."—*Hanson's History of Gardiner and Pittston.*

I conclude this notice of "Oaklands," with the concluding words of a letter to me from Rev. Mr. Gardiner:—"On the whole, the farm, like all other 'gentlemen farms,' has probably cost much more than it has yielded, though just now it returns a fair income."

The Farm of Horace Colburn—Windsor.

The farm of Mr. Colburn is very pleasantly situated upon a stream of considerable size, which is a sort of tributary to the west branch of the Sheepscot river, and very nearly in the centre of the town. This stream is of great advantage to the farm, as it furnishes never failing water for the pasture, power for turning light machinery, and adds much to the beauty and desirableness of the premises. The farm consists of about three hundred acres of clayey loam land, divided as follows:

Mowing,	40	Woodland,	150
Tillage,	11	Pasture,	100
Orchard,	1		

The soil is excellent for grass, barley and potatoes, but not so well adapted for fruit trees, although Mr. Colburn has a young orchard of about seventy-five trees. The stock upon the farm usually consists of 125 sheep, 10 cows, 2 horses, a yoke of oxen, and 6 hogs. The barn, which is 72 by 40 feet, is one of the best in the county, thoroughly built and nearly new. It has a cellar under the whole, which not only serves as a receptacle for dressing, but furnishes excellent winter quarters for sheep. The barn is so situated that the pasture is immediately connected with it, and Mr. Colburn informs me that during the warm months, the sheep and cattle come to the barn every day, and take refuge in the cellar to escape the excessive heat of mid-day. By this plan, much manure is saved which would otherwise be scattered over the pasture to little purpose. His cows are also stabled every night, and the manure in the cellar is mixed with clay, coarse sand, sawdust from the little mill on the stream, &c. It is carted out and turned under in October, the land being sown the next spring with barley. No regular system of rotation of crops is practiced by Mr. Colburn. He places his greatest reliance upon the grass crop, and therefore practices that method which will secure the greatest yield of this crop, without regard to what is termed rotation. He tells me he has invariably obtained the best yield of grass by taking up a piece of sward land—old mowing—in August or September, hauling on dressing in October and spreading it from the cart, then harrowing

down the ground, and in the spring sowing with barley. Wheat has been abandoned since the destruction caused by the midge, and he does not sow oats from the fact that he does not get so good a catch of grass seed, and therefore cannot get so good a yield of hay as where he sows with barley.

In conversation with Mr. Colburn he gave me some facts in regard to the management of his farm for 1863, which I think of sufficient interest to give in this connection. He commenced the 14th of April with seven cows, two of which had not calved. He kept four calves until the 1st of June. The other two cows calved later and the calves were kept on the cows until they were four weeks old. Another cow was purchased in October. A strict account was kept of all the butter made until April 14, 1864, which amounted to 1,310 lbs. In addition to this, milk and cream was used as wanted by a family of twelve persons. During the same year Mr. Colburn made 1,500 pounds of pork, by feeding with the refuse of the dairy about 20 bushels of grain and 40 of potatoes. From his farm stock he made fifty cords of manure, valued at $4 per cord; kept seventy sheep, from which he raised fifty-nine lambs, selling them for $3.50 per head, the wool from the sheep averaging four pounds per head, which brought seventy-five cents per pound. In addition to this Mr. Colburn raised 250 bushels barley, which was sold for ninety cents per bushel, and 500 bushels of potatoes. He cut about fifty tons of hay, and obtained for his labor from other sources than direct farm work, about $200.

Mr. Colburn has a dairy of ten cows, from which butter is made the entire season. The churning is done each day, every operation being conducted with scrupulous neatness, consequently his butter always commands a high price in market. His cows are a mixture of a native, Durham, and Ayrshire. He has a native cow, eight years old, which made in the first week of June, 1864, ten pounds of butter. She had no feed other than that furnished by a common pasture, in which was a large flock of sheep, and the other stock of the farm. Although the cows are stabled every night, they are not fed at the barn until the feed is gone in the pasture. They are then fed on the best hay until they go dry, from that time until some three or four weeks before coming in they are fed with poorer fodder; and during the three or four weeks immediately preceding calving, they have the best of hay, and in addition a small quantity of barley meal.

There are usually upon the farm from five to eight hogs, and the

house where they are kept is a model one in its way, having a cellar that receives the manure, which is mixed with loam, sawdust, and other absorbents. About fifteen cords of superior dressing is manufactured annually in this manner, from six hogs. It requires close attention to supply the matter for absorbents to the various farm buildings where they are needed, but nothing pays a better return for labor and time, and it is a matter that should be practiced to a greater extent by all farmers.

Fairview—Sidney.

The estate of Hon. W. A. P. Dillingham is situated in Sidney, eight miles north of Augusta, on the middle road leading through Sidney to West Waterville. It is in the centre of the town, and commands one of the finest and most extensive views in the county. It is very properly called "Fairview." The home farm and a pasture three miles off, comprise about three hundred and fifty acres, divided as follows: Mowing, 85; woodland, 150; pastures, 160; orchard, 8; tillage, 15. The pastures include about seventy acres of woodland. There is also on this farm a meadow of eight acres, well adapted to cranberry culture; and preparatory steps have been taken for the introduction of cranberries upon it. The soil is a strong loam, admirably adapted to grazing and orcharding. There is probably no farm in the county better stocked with wood and timber than this. The growth consists of maple, birch and beech, with some hemlock, and twelve acres of cedar. The orchards usually produce about one thousand bushels of apples annually, partly grafted, and the balance natural fruit. In 1863 about two hundred barrels of grafted fruit were put up. The fences on this farm are of the most substantial character, consisting of stone feet, iron posts and cedar rails. It has miles of such fence. When built it cost about one dollar per rod.

The farm is well adapted to grass, although when the proprietor built his large barn in 1860, his neighbors thought he must have more money than he could spend judiciously to put up such an immense structure, that could never be one-half filled from the farm. Since then the barn-room has been as fully used as convenience would allow. In order to keep up the condition of the farm, leached ashes have been used freely every year, as a top dressing. The result has been favorable. In 1864 the farm yielded 100 tons of hay as it was weighed when hauled from the field. In 1865 it gave 160 tons. Four hundred bushels of barley have been har-

vested in one year on this farm. Potatoes and turnips have been grown to a considerable extent.

Upon this farm is one of the largest, best-planned, and most thoroughly finished barns in the county of Kennebec, and one of the best in the State. It is located in the rear of the dwelling and stable, upon an elevated portion of the farm, and can be seen at a great distance from all directions, forming a very pleasant and prominent object in the landscape. It was built in 1860. Its dimensions are—length, 100 feet; width, 52 feet; height of posts, 23 feet; from bottom of cellar to ridge-pole, 60 feet; width of tie-up, 16 feet; width of barn floor, 14; width of bay, 22 feet. There is a cellar under the building, averaging about 11 feet in the clear. The basement is entirely and thoroughly built of granite: and granite posts in the cellar support the posts above, and the doors in the basement have granite thresholds. The cellar furnishes a receptacle for manure which comes down from the tie-up; and in addition to a wide drive-way through the centre, it contains apartments for roots and swine. It is light, well-ventilated, and has a hard, dry bottom. The first floor proper above the cellar has a tie-up for cattle, 16 feet wide, on the south side of the barn, furnished with windows the entire length, through which light comes in during the winter and wraps the cattle in a blanket of sunshine, as they lie on the floor. During the summer the windows are furnished with rolling blinds, which when closed make the tie-up too dark for flies to plague the cattle. It accommodates 30 head of cattle, which are secured with chains. It has three separate compartments made by hard wood fences and gates; one part for bulls or calves, one for oxen, and the other for cows. There is one arrangement in this tie-up which is of great value and should be introduced into every barn in the county. It is this: a platform five feet wide and extending the whole length of the tie-up, except across the doors, directly behind the cattle, and raised about six inches, giving a dry and clean walk. In smaller barns this raised platform could be two or three feet wide, and would be one of the greatest improvements that could be introduced into our barns. The entrance to the main hay floor is in the west end of the barn, over a firm granite drive-way about 60 feet long, rising at an angle of 23 degrees. A set of Fairbanks' hay scales are in the floor; and every load of hay or grain is weighed and registered as it is hauled in. This barn will contain 200 tons of hay and the usual complement of grain, in unloading which the patent horse fork is used. There are three

yards for stock on the south side of the barn, in a warm, sheltered location. This large and commodious structure cost nearly four thousand dollars.

Connected with this barn are two large sheds and a stable for horses. The stable is 36 by 40 feet, and will accommodate eight horses, stands on wide granite underpinning over a stone cellar which furnishes cool quarters in summer and a warm home in winter for ten or fifteen swine. There is also a colt stable and yard near the stable, with a floor on the ground. Another adjoining shed for farming tools and repairing carts and the like has a granite cellar which will hold several hundred bushels of potatoes, in which is placed a large "Mott's boiler" used for various purposes. It also has a pump which supplies the boiler with water for cooking food for swine.

Putnam Villa—Winthrop.

The following is condensed from an article which appeared in early numbers of the Winthrop Gazette, and from its historical and other allusions is worthy of being preserved:

"This villa is situated on Prospect Hill in Winthrop, two and a half miles north by west from Winthrop village. The road leading from the village to the villa passes up a succession of hills of gentle acclivity, past the Megguier mansion. On the right hand, one mile and a quarter from the village, is Mt. Eden, from which is obtained a pleasant view of Winthrop North and South ponds, the village, the Island House, Readfield Depot, and the northern mountains. Prospect hill is the highest inhabited point in Kennebec county. From it mountains and highlands are seen in nine counties in Maine. This eastern view extends to hills in Washington, and to the Camden mountains on the sea shore, distant forty-three miles. This view is not mountainous, as Prospect hill stands in the line of Mts. Sabattis, Pisgah, and Magaffy, which divides the hilly region from the mountainous region of Maine. The eastern view from Prospect hill is the most enchanting view Maine can present. Prof. Hiene for many years attached to Com. Perry's expedition to China Sea and Japan, and who sketched the illustrations for that work, has pronounced this the loveliest view on which his cultivated eye ever feasted. Here are spread out as on a map before you the broad and well cultivated farms of Kennebec county, and the elegantly built, well furnished and well supplied farm houses at all points, dot the view and clothe it with life. Oak

hill in Litchfield, Sabattis mountain in Wales and Hill's ridge are seen in the southwest. A portion of the southwestern view is obstructed by the close approximation of Mt. Pisgah in Winthrop, distant two and a half miles. There is presented to the admiring eye, from this mountain, by the west to the north, an array of Nature's greatest monuments. The White mountains, sixty-one miles distant, Goose Eye and Speckled mountains in Grafton, and White Cap in the region of Rumford, are seen in the far distance. These compose the backbone range of mountains, which divide the waters of the Androscoggin and Connecticut rivers. The Letter D mountains, the Byron mountains, Mt. Blue in Avon, Saddleback mountain in Madrid, New Jerusalem peak, Mt. Abraham in Salem and Bear mountain, fifty miles distant in the north, are also observable. The view, as though Nature were unwilling to render any of her works imperfect, is intermediately filled by Streaked mountain in Paris, Bear mountain in Hartford, Mt. Mollocker in Woodstock, Black mountain in Peru, Mt. Zircon in Milton plantation, Puzzle mountain in Newry, Dix's mountain in Dixfield, Roccomeca in Canton, and Little Saddleback in Carthage. Thirty-five prominent mountains are seen from Prospect hill.

Putnamville comprises four splendid mansions, a description of which, together with their surroundings may be interesting. Leonard Sturtevant, Esq., was born in Winthrop, near his present residence. He, and most of his brothers, in early life went to seek for fortune, and were successful in the pursuit. Leonard was wholesale merchant in New Orleans until the breaking out of the rebellion, where he amassed a competence. He purchased the farm, then known as the Perley farm, in 1848, and erected thereon a mansion for his family residence and for his own summer residence, and where he has constantly resided since the commencement of the war. This mansion, two stories high, with numerous ells and porches, is built of brick, connected with which are two large thoroughly built and well furnished barns, together with their out-buildings, the entire cost of which was some $15,000. His farm contains 275 acres, is in high cultivation and is thoroughly fenced with stone wall. It is the best farm in town. He has a young orchard of 800 trees which is well cultivated and which excels any orchard in Maine. He has some two acres of native ornamental trees contiguous to his buildings, on the north and west, consisting mostly of evergreens, the fir and the pine. These afford ample protection in winter from the cold northern winds.

Albert Sturtevant, brother of Leonard, was formerly engaged in building and slate quarrying in New Hampshire, where some of his brothers were largely interested. He built, at Putnam Villa, in 1859, a two story mansion and stable, which are models of beauty and elegance. Although not so large as the other mansions of the Villa, yet in the ornamental it is not excelled in the country. Mr. Sturtevant is constantly engaged in farming and gardening.

Maj. G. A. Benson, favorably known throughout Kennebec county as a gentleman and a business man, in 1853 purchased the height and eastern slope of Prospect hill, and erected a two story mansion, and other buildings, of ample size and proportion. The cost was some $12,000. Maj. Benson was guardian for the Lewis Sturtevant heirs whom he admirably succeeded in educating not only as scholars but as gentlemen; the oldest of whom served as an officer in his country's defence. Maj. Benson, although blessed with competency, does not scorn the appelation, 'farmer,' and his well cultivated acres attest his love of agriculture and skill therein. He is attentive to those who wish to view the natural and artificial beauties of Putnam Villa, and a carriage turn around his vine arbor will in no wise offend him.

John P. Putnam, Esq., who has amassed wealth in California, in the fall of 1865 married a Winthrop lady, a member of the Sturtevant family. He purchased the old Davenport farm, on Prospect hill, and erected a fine mansion thereon in 1866. It is about forty feet square, and two stories high, with a French roof surrounded by an octagonal cupola, which alone cost as much as a small sized house. The mansion has an ample accompaniment of porches two and three stories high, bay windows, porticos, conservatories and walks. It is built of the best materials, and by the best workmen. Two hundred and fifty thousand of lumber, forty thousand of brick, and one ton of lead pipe were used in its construction. There is a cistern in the cellar holding ninety-eight hogsheads, and another in the attic holding seven hogsheads. When the water fails in the attic, it is supplied from the cellar by a force pump. Hot air, gas and hot and cold water are conveyed to each of the twenty rooms of the mansion. Gas is to be conveyed from Portland, in metalic casks. Ten rooms and the halls are stuccoed, six rooms have marble mantles, and eight have marble topped washstands. To appreciate its beauty and convenience it must be attentively examined. It is the finest mansion in this or any adjoining county, and, probably, in the State, excepting Portland. This

description of Putnam Villa, is not given to incite the pride of the owners, for they are gentlemen above vanity, but in justice to those who have made it what it is, an ornament to the town and the boast of Winthrop.

When the excursionist and pleasure seeker visits Maine, let him be advised that he has not seen the whole world until he has looked upon the natural and architectural beauties of Putnam Villa."

Farm of Warren Percival—Vassalborough.

This farm has been the home of the Percivals for over a hundred years, having been owned by father, son and grandson. When its management devolved upon the present owner, it consisted of seventy-five acres; but it has been enlarged by additional purchases made at different times and now comprises 225 acres. It is situated upon what is known as the Cross hill ridge of land in Vassalborough, seven miles from Augusta, and four miles east of the river. The principal part of the farm has a southeasterly incline, is well wooded, and the soil, a strong red loam, rests upon a gravelly and ledgy subsoil, the ledge cropping out in many places near and around the buildings, but not in such quantities as to be a serious obstacle to cultivation. The buildings upon the farm,—judging from the low farm house, which is yet in a good state of repair and so convenient as to render absurd the idea of replacing it for a modern house—are such as would give it the character of what Ik Marvel would call an "old style farm," and consist, beside the dwelling just mentioned, and its immediate outbuildings, of two barns, one thirty by fifty feet, the other forty-five by ninety feet, a stable with basement cellar, thirty by thirty-five feet, and such other outbuildings as are common upon every well appointed farm. The annual product of hay is about sixty-five tons, the average yield of the fields being one and a half tons to the acre; and with the straw, fodder corn and other rough fodder, is equal to about eighty-five tons of forage for winter feed grown upon the farm. But this amount, large as it is, is not sufficient to winter the stock usually kept upon the farm, and every year more or less fodder is purchased, as about the equivalent of one hundred tons of hay is necessary to carry the stock through the winter. This being all consumed upon the farm furnishes a large amount of dressing, and Mr. Percival estimates that from two hundred and fifty to three hundred large ox-cart loads—say one hundred and

fifty cords—are made in a year. A large amount of superior dressing is manufactured in the various yards in which swine are kept—one of which receives the contents of the privy and the sink slops from the house—which being supplied with muck and coarse strawy manure, is converted into a superior fertilizer. This is hauled out in the fall, piled up, shoveled over in the spring and used under corn. Poultry manure is regarded as a fertilizer of great power, and every particle of it is carefully saved. It is used chiefly under turnips by first being prepared in the following manner:—The droppings of the poultry are carefully collected, spread in the barn floor and mixed with plaster in the proportion of two parts of the latter to one of the former. This mixture is shoveled over and allowed to remain some three or four days to become thoroughly composted before it is used. Although applied chiefly to turnips, it is a valuable fertilizer for any crop—an opinion in which many farmers will unite from personal trial. About one thousand bushels of roots (turnips and beets) are raised annually and are fed out to the farm stock during winter. Turnips are almost invariably planted upon sward land, as they do not succeed well upon old ground.

Mr. Percival's chief aim in farming is the breeding of thorough bred stock, and nothing is sold from the farm that has not been converted into them. The stock upon the farm consists of forty-six head of pure blood Shorthorns—of which some mention is made in a previous chapter—seventy Cotswold sheep, one-half of which are pure bloods, the remainder grade, thirty swine of the Suffolk, White Chester and Prince Albert breeds, and four horses. As his main purpose in farming is the rearing of stock, his principal crop grown is hay, and but little attention is given to the culture of the cereals. The crops of the year 1867 were three acres of corn, three of potatoes, one and a half of roots—turnips and mangold wurtzels—and three of grain—barley, peas and oats. There is an orchard upon the farm consisting of two hundred trees, mostly grafted, from which was sold in 1866 about $400 worth of fruit, besides what was used in the family.

It is a rule with Mr. Percival not to let his heifers come in until three years of age. The calves are taken from the cows when about three days old, and taught to drink. Small troughs are provided in their pens into which the milk is turned, and he never has any difficulty in making them drink. No particular pains are

taken with them, and they very readily acquire the habit. The calves are given one half the milk until about two months old, when it is gradually increased, until at from three to five months old all the milk is fed to them. Meanwhile they are fed a few oats and shorts—this being placed in a small trough beside the one they drink from. This is given to keep them growing, and accustom them to eating, so that when the milk is wholly taken from them they will be in readiness to take care of themselves. From the time they are taken from the cows the calves run in a good pasture, thereby having access to fresh grass all the time. The aim is not to force or pamper the calves for sale, but to keep them in a tough, healthy, growing state, and able to "shirk for themselves" and gain without the aid of milk. By this treatment his calves at one year old will girth from five and one-half to six feet.

Mr. Percival has become satisfied that farmers as a general thing plow and plant too much land, as by the system of producing extensive hoed crops the land does not give profit enough for the labor and manure given it. The work necessary to raise hoed crops is laborious, the crops are exhaustive and the manure applied is not much benefit to land in succeeding years after the first crop has been taken off. Convinced of this, he is getting all his tillage land into grass, preparing the fields so they can all be mowed with a machine, and intends to keep up their fertility by top-dressing. This has already been practiced to some extent, and autumn is regarded as the best season for performing the operation. In seeding land he uses fifteen pounds of clover, one peck timothy, and one peck red top to the acre. The good effects of underdraining—the drains being sunk three feet deep, a water course six inches square formed of flat rocks, filled with rocks to within a foot of the top and then covered over with straw before putting in the earth—are plainly visible upon his farm, and what was before almost an impassable bog, is converted into a dry, hard field, which produces heavy grass.

In regard to pastures, Mr. Percival is satisfied he obtains better feed to plow them up once in six or eight years, plant with potatoes the first year, sow with oats the second and seed down, mow for two or three years, and then turn them out again, than he does by always letting them remain in permanent pasture. In this way three or four crops are obtained without hauling any manure from the barns, and he is sure the feed of the pastures is better for the practice.

The Farm of Allan Lambard, Esq.—Augusta.

This farm contains 172½ acres, and was purchased by Mr. Lambard in the spring of 1862. The soil is a clayey loam just suitable for a grass farm. The farm is situated on the east side of he river, and commands a fine view of the city of Augusta, the public buildings, and the beautiful scenery both up and down the river. Fourteen and a half acres lie on the west side of the road sloping towards the river, and the remainder is situated upon the east side and is well located for being farmed to advantage. When the farm was purchased by Mr. Lambard in 1862, it cut about ten tons of hay; but by liberal manuring and judicious management, it was brought up to one hundred tons in 1865, and two hundred tons in 1867. In order to accomplish this, Mr. Lambard has used bountiful supplies of dressing, having purchased large quantities from the Cavalry Camp in Augusta, during the years 1862, '63, '64, and the products since then have shown what a naturally good, but somewhat neglected soil, plenty of manure and judicious management will do towards renovating a farm. There is upon the farm fifty acres of woodland and pasture. Mr. Lambard is an advocate of improved machinery, and makes use of it in every operation when possible. In seeding his land he uses a mixture of twenty pounds of clover, and half a bushel each of herds grass and red top to the acre.

The method of curing hay employed by Mr. Lambard is so practical, and withal so common sense, that I am induced to give it in detail. He never commences cutting grass in the morning until the dew is all off. This is usually about nine o'clock. It then lies until afternoon, when it is put up in bunches. In this state it remains through the night and all of the next day without being disturbed. The second day after being mowed, the bunches are all made over with a fork, by commencing at the top, shaking it apart somewhat and rebuilding it, thus bringing the bottom of one bundle at the top of the other. It then remains until the third day after being mowed, when, if the weather is good, it is opened, has an hour or two's sun, and is hauled in. If the weather is not good, it remains untouched until the next day. Hay cured in this way retains its sweetness, brightness, and all the leaves and blossoms until fed out, and not being all burnt up, the best part is not left in the field when it is harvested. The mixture of seed which he uses in seeding, gives him grass of an excellant quality.

There are upon the farm three barns. They are so located that

their S. W. and N. E. corners join each other, making warm yards for stock on the south side, the buildings protecting them from the cold winds. The main barn is 50 by 72, 23 feet posted, the second 36 by 60, and the third 34 by 44, all of them having cellars, and all built in the most thorough manner. The first has accommodations for seven horses, together with considerable other stock; gives storage to one hundred tons of hay, has a granary 22 by 24 feet, is provided with a pair of Fairbanks' scales, has water in the room used as a stable, and other conveniences. The second is used as a hay barn and has accommodations for fifteen head of cattle. Under it is a cellar, which besides giving room for manure, affords a good place for the storage of carts, and farm implements of which Mr. Lambard has a large number of the most approved kinds. The third is used wholly as a grain barn. Under the main floor is a floor which is fitted up for young neat stock. The straw is fed to them through a scuttle in the floor, and still below is a basement for receiving manure. In addition to these barns, a colt barn or stable thirty by fifty feet, provided with a superior cellar, and containing twelve stalls, was erected in the summer of 1866. Connected with it is a large, warm yard, provided with water, in which the colts are turned out for exercise. Mr. Lambard uses saw dust as a divider and absorbent of manure, and keeps on hand through the summer, nearly all the manure made by a large stock of cattle during the winter. The amount made in a year is about one hundred cords. This is used in the fall, a considerable portion of it as top-dressing on grass land at the rate of from five to seven cords per acre. The barns and yards are supplied with pure spring water, brought from a distance of about forty rods.

The stock consists of forty-six head of pure bred and grade Devons and Jerseys—having been obtained from the celebrated Patterson herd of Baltimore, and from William S. Grant of Farmingdale. He has a flock of sixty full blood Southdown sheep, purchased of Mr. C. S. Wainwright of Duchess county, N. Y. These average six pounds of wool per head. Twenty horses and colts are kept upon the farm. A few years ago Mr. Lambard purchased in New York one cow, one calf six months old, and two sheep which cost him when he reached home $675. This shows the love he has for the pursuit of farming, and it also shows "how to do it."

In the elegant, roomy and well arranged stable erected by Mr. Lambard in the summer of 1866—where everything for the comfort

and health of the horse and the convenience of his keeper has been introduced—is an arrangement for the prevention of cribbing, if the horse chances to be addicted to it. It consists of a number of wooden balls about four inches in diameter, turned from the hardest and toughest of wood, and extending across the stall at the top of the manger, being "strung," so to speak, upon an iron rod about three-fourths of an inch in size. If the horse attempts to bite these balls they revolve upon the rod, and the animal is compelled to loose his hold upon them. The plan has something to commend it, but for horses strongly addicted to the evil, I believe quite a different course of treatment would be necessary.

Upon the farm is an orchard of some one hundred and seventy trees, the greater part of them old, but in most excellent condition. The grass is kept down around every tree, and the soil is stirred nearly the distance to which the top extends. The trees are also mulched, potato tops, corn stalks, refuse straw, &c., being used for this purpose. From this orchard in 1863, was sold $350 worth of fruit; in 1865, $613 worth; and in 1867, $200 worth. One tree of Tallman sweets produced in 1867, six barrels which were sold for $5 per barrel. Beets and turnips are grown to some extent for stock. In 1867, from three-fourths of an acre, were harvested seven loads of turnips, of seventeen hundred pounds per load, making eleven thousand nine hundred pounds, or a total of thirty-five thousand seven hundred pounds per acre.

Mr. Lambard gives me the following as his agricultural "creed": He believes in underdraining, thorough culture and liberal manuring. He believes in barn cellars, and regards them worth more than their cost, simply as places for the storing of carts, plows, sleds and other farm implements. He believes in Knox colts, Devons for work and beef, and Jerseys for butter and cream. He believes in Southdown sheep, Bolton Grey hens, and the best of care for all farm stock. He believes in pure blood, and keeps no stock unless it comes under this class.

CHAPTER VI.

AGRICULTURAL SOCIETIES;—INDUSTRIAL EDUCATION;—FARMERS' CLUBS.

The first agricultural society in Maine was established in Kennebec county. It was started as early as 1787, through the efforts of the Messrs. Vaughan of Hallowell, and other prominent farmers of the county, but I have no evidence that it was incorporated.

The same remark is true of an association called the "Kennebec Agricultural Society" which commenced its operations in 1807. The first incorporated society was the "Winthrop Agricultural Society" which had existed as a social organization for several years. It was incorporated by the Legislature of Massachusetts at the session of 1818, and the bill was signed by Governor Brooks, February 21st. According to previous notice the first meeting of the society was held at the house of Dean Howard in Winthrop, July 4th, 1818, at which a constitution and by-laws were adopted (signed by thirty-four members) and a board of officers elected. The first officers were:—Samuel Wood, Esq., *President;* Nehemiah Pierce, Esq., *Vice President;* Dea. Joseph Metcalf, *Corresponding Secretary;* Alex. Belcher, *Treasurer;* Rev. David Thurston, Dr. Peleg Benson, Dr. Issachar Snell, Mr. Joseph Norris, Mr. David Foster, *Trustees.* These were among the most intelligent and influential men in this section of the State, and were earnest promoters of the objects of the society. I have given some account of the first president of this society in a previous chapter.

The object of this society, as stated in the constitution, was "to improve the art of husbandry, and to elevate the calling of the husbandman;" and from the early records, it appears they at once entered into this work with a zeal and enthusiasm that we seldom find at the present day. Among the votes passed at the meeting held on the 4th of November, 1818, is one "empowering the trustees to inquire into the utility of Hotchkins' Threshing Machine, and that they purchase one for the use of the society if they think expedient." At the meeting held March 3, 1819, resolves were passed instructing a committee to confer with the trustees of the "Maine Agricultural Society," to offer a liberal premium for a good stock horse, "as," says the resolve, "it is with deep concern we can but notice the almost total silence and neglect in relation to a noble race of animals—the horse." A vote was also passed raising a committee for the purpose of proposing *tasks* to the members. We also copy the following as being of interest, and as showing the active efforts of the society to elicit practical information:

Voted, That as great benefit in every employment, and especially in the concerns of agriculture, is to be derived from system, and as almost every farmer has some source of profit, on which he principally depends for the remuneration of his labor, *Resolved,* That every member be requested to make a written statement to

be exhibited at the annual meetings of the society, respecting the manner of managing his favorite source of profit, and the net gain which he receives from it.

At the meeting held November 3d of this year, it was "voted, that the answer to the task on raising onions, communicated by Samuel Wood, Esq., be put on file." At a meeting of the society held November 17th, it was voted that the Corresponding Secretary be instructed to correspond with the secretaries of other agricultural societies in Maine and Massachusetts for the purpose of obtaining information on the subject of agriculture, and that "all expense of postage be paid out of the funds of the society." At the same time, among other votes and resolutions intended to draw out information, Samuel Wood, Esq., was chosen a committee "to ascertain the number of barrels of whole and of watered cider made in this town (Winthrop) the present year."

I am unable, from a pretty close reading of the records to find out what the annual assessment of members was; but in the rules and regulations we find something said about the treasurer of the society taking charge of all the moneys due the society, as well as those contributed, and this clause added: "Every member who shall be absent from meetings, except in case of sickness, shall pay to the treasurer twenty-five cents. The members shall punctually pay all taxes levied by the society." The funds from the above sources must have increased at a considerable rapid rate, for as early as 1821, at the meeting held March 7th, a committee was appointed to consider upon the best way of appropriating the surplus funds of the society, as well as upon what measures should be taken to increase the same. At subsequent meetings in that year, the committee reported, and premiums were decided to be given to the farmer who should raise the most and best quality of "high red top grass seed, so called," and it was also decided that thirty dollars be sent to some part of Spain, "say Malaga or Gibraltar," to purchase the best quality of bearded summer wheat for the use of the society. From the records of the meeting of March 6th, 1822, it appears that the wheat had been sent for and was immediately expected. It was to be delivered to members of the society only, "and one peck, only to a member," on the payment of prime cost. It was placed in the hands of Samuel Wood, Esq., and if it was found that the wheat would not vegetate, it was to be "disposed of for bread at the best advantage for the society."

The following appears in the record of the meeting held Nov.

6th, 1822: "*Voted*, That the Society take two copies of the publick Paper published in Boston called the New England Farmer, and that two of the Trustees become subscribers, therefore Chosen, Samuel Wood, Esq., and Willm. Richards, Esq., subscribers as above." In the following year it was voted, that "the necessary expenses which may be incurred by N. Pierce, Esq., in procuring information on the subject submitted to him by task, to ascertain the relative advantage of the State of Maine compared with other States and countrys in raising fine wool, be paid by the society."

The following votes from the records of 1825 are of interest as showing the continued activity of the society in procuring information and testing experiments destined to be of value to its members: "*Voted*, That the Corresponding Secretary be requested to correspond with Mr. Custus respecting the quality and usefulness of a kind of sheep owned by him, called the Smith Island Sheep, and that if the Trustees shall judge expedient, that he purchase a pair at the expense of the Society. *Voted*, That the Trustees be authorized to appoint or employ some person to make an experiment on raising Hemp on a small scale, at the expense of the Society."

From 1825 to 1829 the society appears to have been in an inactive state, as no account of its doings are to be found. At the session of the Legislature in 1829, the "Winthrop Agricultural Society" was incorporated by the State of Maine, and Feb. 28th received the signature of Enoch Lincoln, who was then Governor. It appears to have been an entirely new organization, and in the records of the first meeting, are votes instructing the new Secretary and Treasurer to collect from the officers of the old society all moneys, books, papers, &c., in their possession and receipting for them if demanded. The officers elected in 1829 were as follows:

Capt. Samuel Benjamin, *President;* Mr. Columbus Fairbanks, *Vice President;* Dr. Charles Hubbard, *Cor. Secretary;* Thomas F. Lee, *Rec. Secretary;* Mr. Joseph A. Metcalf, *Treasurer;* Mr. Joshua Trufant, jr., *Collector;* Rev. David Thurston, Elijah Wood, Esq., Mr. Nathan Howard, *Trustees.*

Article 14 of the By-Laws of the new society reads as follows: "A cattle fair shall be held on such day in the month of September of each year, and under such regulations as the Trustees shall order." This is the first record that appears in relation to a Cattle Show, and I believe no year has passed from that time to the present, that such an exhibition has not been held by this society.

The following are extracted from the doings of the meeting held Sept. 1st, 1830:

"*Voted*, That the Corresponding Secretary be requested to write to Dr. B. Snell of Virginia, to send the Society one barrel of Winter Wheat. *Voted*, That the Trustees be authorized to offer a premium of three dollars for the best crop of corn, wheat or potatoes to be raised next year, to be paid to him who raises the *largest* crop at the *smallest* expense. *Voted*, That Nathan Howard be a committee to prepare questions for the use of the Corresponding Secretary in corresponding with other societies, as contemplated by the report which the Trustees have this day offered."

At the meeting held March 21st, 1832, one hundred and twenty-two members were elected, the names comprising some of the most prominent men of the time, residing in the county; and on April 23d of the same year, the society having greatly extended its action and influence through other towns in the county it was merged into the "Kennebec County Agricultural Society."

Early in 1832 the society began to turn its attention to sheep husbandry, and appointed a committee* to collect information upon "the diseases to which sheep are subject in this climate, with the preventive and cure, the best breeds of sheep and the mode of improving them, with such matter as would be useful in a treatise on sheep generally." At the meeting held Aug. 28th, 1833, the above committee were instructed to "report their doings to the publishing committee without any unnecessary delay."†

The following votes passed at the meeting March 5th, 1834, will show the activity of the society in matters designed to aid and encourage the art of improved farming:

"*Voted*, That Ezekiel Holmes, Nathan Howard and Thomas Pierce be a committee to examine the new invented horse Power recently invented by John A. Pitts of this town, and report their opinion of its merits and utility. *Voted*, That the Trustees be instructed upon the reception of the oats imported from Scotland to put them up at auction, allowing no one person to purchase more than one-half bushel. *Voted*, That a premium be offered by the

* Consisting of Dr. Amos Nourse, Charles Vaughan, Esq., John Merrick, Esq., Elijah Barrell, Esq., and Elijah Wood.

† The "Northern Shepherd" published under direction of this society in 1835 contained the results of this committee's investigations. Some doubt has been expressed as to whether this was the work of Dr. HOLMES, but the following from the records of the society puts the matter at rest: "March 5th, 1834, *Voted*, To allow the amount of $25, exhibited by Dr. E. Holmes for his services in preparing Treatise on Sheep, &c."

society to the man or men who may bring into this county twenty of the best Rams or Bucks of the Merino Breed before the first day of November next. *Voted*, That ten volumes of the Maine Farmer be offered in premiums the ensuing year under the direction of the standing committee."

Sept. 17, 1834 it was resolved unanimously, "that this society decidedly disapprove the sale of ardent spirits on the grounds occupied by them on the days of their Cattle Show."

From the earliest period of the society's history, it was a custom to select some one of their number to deliver an address at the annual meeting, and no votes appear oftener upon the records than those thanking the persons for their "able and interesting address" and requesting a copy for publication. These as well as the annual reports of the Trustees were published in the early volumes of the MAINE FARMER, and the latter often contained many good and judicious suggestions. Frequent votes were also passed raising a committee or instructing the Secretary or Trustees to examine agricultural works, and procure the same if they thought expedient. Among these that I now remember from looking through the records were "Davy's Agricultural Chemistry," and the "Supplement to the Farmer's Register." Copies of the latter were also offered as premiums.

At the meeting held March 1st, 1837, it was "voted to direct the Corresponding Secretary to write to Mr. John Gordon of Portland for information on the Drill Plow." At the semi-annual meeting held in August of the same year, lengthy resolutions were passed in which a premium of ten dollars was offered to "that person who shall in their opinion, in writing, produce the most satisfactory history of the insect usually called a weevil or grain worm, which has of late been so injurious to the grain in many places." The following also appeared in the records:— "*Resolved*, That the cordial thanks of this society be tendered to Mr. ——— Ronaldson of Philadelphia for the exertion he has made to improve and promote the cause of agriculture by the importation of seeds, &c., and that they beg leave to express their regret for the failure of his enterprise, and their best regards for his future welfare and success in life."

These extracts from the records of this society demonstrate its early activity and prove of what material it was composed; and although the records of succeeding years are as full of interest— showing that the society early passed resolutions for urging the

establishment of a National Department of Agriculture, recommending a State bounty on wheat, and evincing great activity in any object tending to promote the interests of all branches of agriculture—I feel compelled to omit further extracts. Having held exhibitions in different parts of the county, from its commencement, and deeming the plan of locating to be for the advantage of the society, in 1856 grounds were selected at Readfield Corner, and the exhibitions have since been held at that place. These exhibitions are well attended, and the society has always kept up the plan of having an address form a part of the exercises of the annual fair. It now numbers about three hundred members, and its affairs are in a prosperous condition.

The North Kennebec Agricultural Society was incorporated July 31, 1847, and its first exhibition was held at Waterville, in October of that year, the annual address being given by the late Dr. E. Holmes. The original limits of the society included the towns of Fairfield and Smithfield, in Somerset county, Waterville, Belgrade, Winslow, Clinton, Sebasticook (now Benton) China and Albion in Kennebec, and Unity and Burnham, in the county of Waldo. Its first officers were: Samuel Taylor, Jr., *President;* Ebenezer H. Scribner, *First Vice President;* Thomas Fowler, *Second Vice President;* Harrison A. Smith, *Secretary;* Joseph Percival, *Treasurer and Collector;* Stephen Stark, *Agent;* William Dyer, *Librarian;* Samuel Taylor, Jr., Asher Hinds, Sumner Percival, John F. Hunnewell, Reuben H. Green, *Trustees.* This society purchased grounds in 1854, which are located about one mile below the village of Waterville, comprising twenty acres. They are well fenced and there is upon them, one of the best half mile trotting courses in the county. The society is free from debt, is under excellent management, and its exhibitions are in the highest degree successful.

The South Kennebec Agricultural Society received its act of incorporation March 26th, 1853. The original officers were Nathan Foster, *President;* Daniel Fuller, John S. Mitchell, John Neal, *Vice Presidents;* Rev. J. W. Hanson, *Corresponding Secretary;* George M. Atwood, *Recording Secretary;* N. Foster, George Williamson, William S. Grant, *Trustees;* J. M. Carpenter, *Treasurer and Collector.* The exhibitions of this society were held at Gardiner and were well attended, but in consequence of some difficulty it was deemed prudent to surrender the charter which was done March 16th, 1860.

The Kennebec Union Agricultural and Horticultural Society was incorporated by the Legislature of the State, March 17th, 1860, its first officers being, Nathan Foster, *President;* Gilmore Blinn, Josiah True, Horace Colburn, *Vice Presidents.* The grounds of this society were located at Gardiner, but having passed beyond the control of the society in 1866, no exhibition was held by this society in 1867.

Means for providing an industrial education for young men were early put in operation in the county, the first of which was the Gardiner Lyceum, incorporated by the Legislature of Maine at its session in 1822, the bill receiving the signature of Albion K. Parris, then Governor, January 30th. Although I have had access to the records of the Board of Trustees from the organization of the institution until it was discontinued, I fail to find therein anything of general interest, and cannot better give an idea of the objects for which the institution was chartered and its general scope of instruction, than by copying a portion of the petition presented to the Legislature by Hon. R. H. Gardiner and fifty-one others, which was instrumental in securing the act of incorporation:

"* * * * *And whereas*, it is an object of very great importance to any State, but especially one possessing fine views and a fertile soil, numerous mill seats and a coast indented with many and capacious harbors—to a State rapidly increasing in commerce, agriculture and manufactures; that its artisans should possess an education adapted to make them skillful and able to improve the advantages which Nature has so lavishly bestowed upon them; *and whereas*, the State of Maine is in possession of those numerous privileges, yet while she has liberally fostered her colleges for educating young men for the learned professions, and possesses numerous academies for preparing youth to enter those colleges, and for making useful schoolmasters; she has hitherto omitted to make provisions for giving instruction to her seamen, her mechanics, and her farmers, upon whom the wealth and prosperity of the State mainly depends. The recent improvements in chemistry which give the knowledge of the nature of fertile and barren soils, and the best mode of improving them, render the importance of a scientific education to her farmers much greater than at any other period. * * * * * * They would therefore pray your honorable bodies to incorporate a school for the above purpose with a body of seven trustees, with the usual powers and privileges, to be

called the Gardiner Lyceum, and to grant such aid as will enable the trustees to bring the school into immediate usefulness."

Mr. Benjamin Hale took charge of the institution, and delivered his inaugural address January 1st, 1823. It was printed, and is a very sound and able presentation of the connection of science with the useful arts. Mr. Hale was a graduate of Bowdoin College, was afterwards Professor of Chemistry in Dartmouth College, and subsequently President of Geneva College, N. Y. When first started this school attracted considerable notice, and from a catalogue of the institution published in 1824, I learn the number of pupils to have been fifty-three, divided as follows: First class, eight; second class, thirteen; third class, thirty-two. The course of study extended through three years, and was divided into three terms annually. In order to accommodate many who wished to attend the institution during the winter season only, the trustees established a separate course for their benefit. The course of study at this winter term embraced surveying, navigation, carpentry and civil architecture, and chemistry. The tuition fees for this course were only ten dollars. A winter course for farmers was also established, but with what success I am unable to say.

During the time Mr. Hale occupied the position of Principal the institution met with a good degree of success. For a time the State aided the school to the amount of $1,000 per annum, but after it was withdrawn, Hon. R. H. Gardiner, who was the principal contributor, wished to close it; however, yielding to the solicitations of the other trustees, he advanced the necessary funds to continue it a year or two longer. After Mr. Hale's resignation the institution was successively under charge of Edmund L. Cushing, Ezekiel Holmes, Mr. Whitman, and Jason Winnett, with indifferent success, and in 1857 the property belonging to the institution was sold to the city of Gardiner, and the proceeds divided *pro rata* among the original contributors.

A "Department of Manual Labor" was inaugurated in connection with Waterville College in 1829, and a friend at Waterville—whose name I am not permitted to mention, but to whom I am indebted for great assistance in the first part of this work—has, at my request, prepared the following interesting and judicious sketch of the design and workings of this Industrial Department, which I am glad to present in this connection:

"With whom the plan of the department originated cannot now be ascertained, but whoever may have been its author, it found favor with the President, Dr. Chaplin, and with a portion of the Board of Trustees, while others lacked faith in it from the beginning. In the early part of 1829, Rev. Daniel Merrill of Sedgwick, who seems to have been one of its most zealous advocates, became an agent to solicit funds to establish workshops, and continued to act in that capacity, at intervals, for some three years or more. Mr. Merrill was one of the founders and original trustees of the college, and was, till his death, a very active participant in its affairs. During his youth he had served three years in the revolutionary war, and after its close entered Dartmouth College, where he graduated in 1789. The remembrance of the hardships of his own early life may have stimulated his efforts to provide means by which poor young men might help themselves while prosecuting their studies in the college. Among the donations in aid of the enterprise were two from Nicholas Brown of Providence, the benefactor of Brown University, and from whom that institution took its name.

The first shop was built in 1830, upon the college grounds and chiefly by the hands of the students. It was organized and set in operation by Mr. D. N. B. Coffin, who in January, 1831, removed from Sidney to become steward of the 'commons' and superintendent of the mechanical department. He soon put up, by the labor of the students, a second and larger shop. The workmen employed in the shops were all members of the regular college classes. Three hours per day were assigned for labor, and students were not allowed to be in the shops during study hours. The articles manufactured were chiefly doors, blinds, sashes, bedsteads, tables, chairs, and boxes for soap and candles. The work was prepared by the superintendent in the absence of the operatives; and the principle of division of labor was very fully carried out. Thus, for example, some sawed the lumber, while others planed it; and a well known and useful clergyman of after years, who had for his work a single detail in door-making, was jocosely said to have '*mortiсed* his way through college.' One of my informants, who first entered the shops in 1835, states that his own duty was to keep the tools in order, and that he ground the cutting tools regularly twice a week, and whet them daily. These particulars are given as showing that the theory and organization of the business were not defective. Besides the earlier shop work, the 'steward's

house,' better known later as the 'commons house,' was built in 1832, students performing the labor throughout, except that of preparing the cellar.

At the expiration of the Presidency of Dr. Chaplin, in 1833, Mr. Coffin resigned his place and was succeeded by Mr. William Jenney, a student and a carpenter by trade, who acted as superintendent for the next three years. Under the new President, Dr. Babcock, a third shop was built and operations considerably extended. Carriage work was added to the previous list, and the painting and staining of furniture and other goods manufactured was carried on.

In 1835, to supply a real or supposed demand, a printing office was opened in one of the shops, notwithstanding the fact that a printer had but a little time before been starved out of town after a long struggle for support. A manufacturer presented a new and valuable press, and this with a stock of material, was put into the hands of a student who had been bred a printer. The 'College Press' turned out job work, the annual catalogues, and, as perhaps its largest undertaking, a catalogue of the college library, an octavo pamphlet of thirty-four pages. When, however, the printer graduated in 1838, probably from the lack both of profits and a successor, the press was sold and typography struck from the roll of college arts. The printer has been for some years pastor of a church in Washington and chaplain of the U. S. Senate.

In 1836, students were employed under master-workmen in preparing lumber for the college chapel and for three professors' houses which were built that year. They did also some of the simpler and coarser work in the erection of those buildings. One who was engaged upon the chapel as a bricklayer has been for many years a clergyman of note in the state and city of New York, and is an author of some reputation.

At this date a more extensive business was carried on than at any time before or afterward. Three shops were fully occupied, one of a single story 20 feet by 80, the others of two stories and 20 by 80 and 20 by 40 feet respectively. There were, besides, two store houses for lumber, &c., of about the same dimensions as the smaller shop. In September, 1836, Dr. Pattison became President. An examination into the financial condition of the college had shown that some thousands of dollars had been sunk in the Manual Labor Department. Mr. Henry Pierce, a skilful and experienced mechanic from Middleborough, Mass., was hired to act as superintendent for one year from August, 1836. At the end of the year,

the concern still proving a losing one, the shops were let to Mr. Pierce for the following year on condition, in the words of the record, that he should 'take not less than twenty students into the shops, and as many more as he can employ profitably,' their labor to be restricted to such hours as the faculty should prescribe. Mr. Pierce soon associated with himself, Mr. J. B Bradbury, and the two for several years carried on business for themselves. During this latter period the college received a trifling income from its investment, and those students who were mechanics and dependent on their own exertions earned enough to pay their way wholly or in part. In the spring of 1842, the shops were finally abandoned, and in the course of a few years were sold and removed from the college premises.

It seems evident from sufficient testimony that the shops were from the first as well managed as could have been reasonably expected. The several superintendents were active and energetic business men, who may have disapproved of some of the schemes of their superiors; but the financial failure of the department cannot, it would seem, be fairly attributed to incompetent management in any quarter. Pecuniary loss was inevitable from the nature of the case, and any degree of skill on the part of the conductors would not have materially changed the result. The want of success may without doubt be mainly referred to the fact, that, although the young men who had learned trades before entering college, as well as the more apt of those who had not, were good and profitable workmen, taking an interest in what they did, a larger number felt little interest or responsibility, and therefore gained no skill and produced inferior work. For such work there was no ready market—the college manufactures acquired a bad reputation, and thus even good work may have often remained unsold too long for successful business. It was soon after the opening of the shops that the manufacture of doors, blinds and sashes, by machinery, was first introduced into Maine. Hand labor could hardly compete on equal terms with that done by water power, but yet it is probable that, at that time, hand made articles of the kinds enumerated, yielded a moderate profit, when so well made as to be readily salable.

But the money spent upon this 'Utopian scheme,' as many have called it, was by no means thrown away. The opportunity for profitable labor brought to the college an increase of students which, in part at least, cancelled the loss to the treasury; but

what is of more importance, a class of young men most valuable to the world by reason of the qualities which were developed and strengthened in their struggle for an education, were materially aided in their preparation for life. The list of laborers in the shops bears the names of many of the most honored sons of the institution, men of energy, ability and culture. Among others occur the names of three college presidents. The first in order of graduation, a man of brilliant talents, died in early manhood: the third has, within the last year, been vainly solicited to return to New England, that he might become the head of one of her oldest and most respectable colleges. And though partially aware of the facts before, I must confess that a more careful inspection of the list of graduates of the ten years between 1832 and 1842, has caused me some surprise as I have observed how very large a percentage of the best of them were *graduates from the workshops.*"

Previous to the late rebellion several farmers' clubs in the county were in an active state, holding meetings for the discussion of agriculture and kindred topics, once in two weeks, (some of them once a week,) during the winter season. Among the most influential of these were those located at Waterville, China, Litchfield, Monmouth and Gardiner. The reports of the meetings of the Waterville club, as given in the *Eastern Mail,* published at Waterville, were of more than ordinary interest, and gave publicity to the experiments and practices of some of the best farmers in the county which would otherwise have remained unknown. I have the testimony of one of the best farmers in the northern part of the county, that at these social meetings many useful little hints and suggestions were brought out, and put in practice by others, that would but for them have been lost, and consequently great good was done thereby. In some towns, especially in China, Monmouth, Gardiner and Litchfield, the organizations have been kept up to the present day, and town fairs, under their direction have been held annually, but the winter meetings for discussion have been abandoned. I should like to see them generally revived throughout the county, and believe much good would result from them.

In the spring of 1866 the North Kennebec Wool Growers' Association was organized at Waterville, the limits of the society being the same as of the North Kennebec Agricultural Society. Its first officers were: Samuel Taylor, *President;* Joseph Percival, *Vice President;* Ephraim Maxham, *Secretary and Treasurer;* W.

A. P. Dillingham, N. R. Boutelle, C. B. Cates, George Richardson and I. W. Britton, *Trustees*. Public sheep-shearings were held under the auspicies of this association in the spring of 1866 and 1867, the first exhibitions of the kind, I believe, in the State. They were very well attended, and will probably be continued.

Associations—not incorporated—for the purpose of developing the speed of horses are located at Augusta and Waterville, which hold annual exhibitions, but I fear their management is directed for the benefit of the few instead of the many, and question their benefit to the county at large or the place where they are located.

CHAPTER VII.

Manufacturing Operations.

I have deemed it advisable to make the exhibit of the manufactures of Kennebec county as brief as possible, and to accomplish this have not only made my descriptions and statements very condensed, but mentioned only the more important, leaving out the small mills of various kinds and other local manufactures carried on to a limited extent in the different towns. And here I desire to acknowledge the assistance in this division of my subject, I have received from the series of articles on the "Manufactures of Kennebec," prepared for the Kennebec Journal during the summer of 1867, by my friend, Mr. Edward Stanwood, formerly associate editor of that paper, and now connected with the Boston Daily Advertiser.

Lumber. The manufacture of the various descriptions of lumber is by far the most extensive branch of industry, aside from farming, carried on within the county. Commencing with Augusta, I will enumerate the firms engaged in the lumber business, giving the principal statistics of each.

Kennebec Land and Lumber Company employ one hundred men, and cut out in 1866, 4,808,000 feet of long lumber; 1,581,000 laths; 1,000,000 shingles; 400,000 clapboards; 30,650 pickets for fence, and sold refuse lumber and wood to the amount of 2,300 cords. Total value, $200,000.

J. P. Wyman & Son, doors, sash and blinds; employ sixty hands; manufacture annually, 14,000 doors, 20,000 windows, 5,000 window frames, 1,000 pairs blinds. Total value, about $125,000.

Lancey & Smith cut out 2,000,000 feet of long lumber, 1,500,000

shingles, 1,000,000 laths, 150,000 clapboards, 50,000 fence pickets, and 15,000 sugar-box shooks in a year. Total value, nearly $100,000.

Charles Milliken employs twenty-five men. and cuts 5,000,000 feet of lumber a year. In addition, he manufactures 400,000 clapboards, 1,500,000 shingles, and a large amount of other short lumber, the whole being worth about $150,000.

D. G. Baker & Co., give employment to fifteen hands, manufacturing annually half a million feet of lumber, 500,000 laths, 400,000 shingles, and other short lumber. Total value, $25,000.

Bangs & Mosher employ thirty-five men, manufacture 14,000 doors, 15,000 sash, and 10,000 pairs blinds, besides a large amount of house finish, &c. Total value, $70,000.

E. Atkins & Co., give employment to twelve men and manufacture 15,000 box shooks annually. Total value, $12,000.

Smiley & Church, manufacture annually, $5,000 worth of fence palings, &c., employing six hands.

Freeman Barker makes 100,000 pairs of barrel heads a year, worth about $7,000.

The manufactures of the city of Gardiner are the most important in the county of Kennebec. The power used is altogether water, and is afforded by dams across the Cabbassee Contee river. This stream is fed by thirteen ponds, many of them large, with a total surface of 15,000 acres. These several ponds drain a surface of about 250 square miles. It has reservoir dams at the outlets of three of the largest ponds, which restrain and regulate the flow of the water, and by raising which the value and certainty of the supply of water would be greatly increased. Within one mile of the confluence of the Cabbassee Contee with the Kennebec river, are situated all the manufactories of Gardiner, being located upon eight strong and well built stone dams, with a total fall of 132 feet.

N. O. Mitchell employs forty hands, cuts 3,000,000 feet of long lumber, and manufactures 1,200,000 shingles, 600,000 clapboards, 500,000 laths, and 12,000 box shooks annually. Total value, $175,000.

Arthur Berry employs forty men, saws 5,000,000 feet long lumber, 4,000,000 shingles, and 500,000 clapboards. Total value, $150,000. First commenced upon the same site now occupied, in 1835.

Daniel Gray employs sixteen men, and saws annually, 1,200,000 feet long lumber, and 800,000 short lumber.

P. S. Robinson makes $2,000 worth yearly of sash, blinds and doors.

H. W. Jewett employs thirty-five men, sawing 2,500,000 feet of long lumber, 2,000,000 shingles, 500,000 clapboards, 300,000 laths and other short lumber to the value of $700,000.

Hooker, Libbey & Co., employ sixteen men, cutting 2,000,000 feet of long lumber, 1,500,000 shingles, 300,000 clapboards, 300,000 laths and other short lumber, of a total annual value of $600,000*.

Drummond, Richardson & Co., Waterville, employ twenty-five hands, and cut 700,000 of lumber annually. Total value, $30,000.

Furbush & Sanders, Waterville, employ about twenty hands in the manufacture of doors, sash and blinds.

Agricultural Implements. Quite early in the history of agricultural improvements in this country, farmers began to turn their attention to making better tools for doing work, and also to the invention of implements and machines to do away with some of the hard labor performed by hand. Among the first of these implements was the threshing machine. Mr. —— Pope of Hallowell, was the first to introduce such a machine to the notice of farmers, and his efforts in the way of invention were commenced about 1826. The machine went by hand, and by turning a crank a series of mallets or swingels came over on a table, upon which the heads of the grain had been placed by the man tending it, and thus the grain was pounded out. It threshed the grain well, but it was found to be harder work to turn the crank than to swing the flail. Mr. Balon† of Livermore, then in Kennebec county, acting upon the idea of Mr. Pope, in a few years made an improvement upon it by constructing a pike or scutching cylinder, moved by horse-power. This power was applied to an old-fashioned cider mill sweep, the horse going round in a circle, but with very simple gearing. It was found to be a slow operation, and was soon given up. Mr. Balon's idea, or patent, was purchased by Mr. Samuel Lane of Leeds—also at the time in Kennebec county,—who set about making one of his own contrivance, which should have both speed and power to perform the work. He got up the endless chain horse-power, driven by a single horse, with high gearing to his cylinder, and this accomplished the work. In the address to which

* For interesting statistics of the lumber trade of Gardiner in 1864, see Appendix.

† Address of Dr. Holmes before Kennebec County Agricultural Society in 1864. See Agriculture of Maine, 1864; pp. 114.

reference has been made Dr. Holmes says: "I had something to do in assisting Mr. Lane to get his patent, and to induce a few monied men to form a company with him and push it into use; and to my certain knowledge that company had paid out *twenty thousand dollars* in getting that machine into use before they received a single dollar in return. * * * And I look upon the Lane threshing machine not only as having the honor of first inducing the farmers to have their grain threshed by horse-power, but of also threshing the farmers into a better appreciation of the benefits of machinery in facilitating their operations." It was not long after the Lane machine became successful, in 1833, that the Pitts Brothers of Winthrop, conceived the idea of making a wider endless chain of wood, and mounting two horses upon it instead of one, thus doubling the power and the speed; and in a short time the combined thresher and separator was built and patented by them. The horse-power thresher and separator of to-day is virtually the same as that invented by the Pitts Brothers twenty years ago, and from Kennebec county it has gone into almost every State in the Union.

All hand tools of iron or steel, such as scythes, sickles, axes, hoes, forks, &c., were formerly made by the "village blacksmith," and were heavy, bungling, unwieldy affairs as compared with the light and elastic tools of the present day. Kennebec county has also the honor of having given to the farmers of the State the first improved hand tools, such as above enumerated. In 1841 Jacob Pope of that part of Hallowell now known as Manchester, commenced the manufacture of the first polished spring steel hay and manure forks ever made in Maine. The forks were much lighter than those then in use; the tines were smooth, and they at once found a ready sale, displacing the old home made implements. Although but few were made at first, the demand for them continued, and Mr. Pope enlarged his works, putting up a steam engine of twenty horse-power,—there being no water-power at the place where his works were situated. It was not long before other parties engaged in the manufacture of forks, and as Mr. Pope could not compete with those who employed water-power, he abandoned their manufacture upon an extensive scale, and only made a few for home market. The forks, however, acquired a great reputation, and Mr. Jacob Pope, son of the above, still lives upon the old place and manufactures annually about three hundred dozen for those who desire a genuine "Pope fork."

Elias Plimpton commenced the manufacture of hoes at Walpole, Mass., in 1820, and was the first in the United States to make hoes by machinery. He came to this State in 1825, settled in Litchfield, and was the first person to make hoes by machinery in this State. In 1845 Mr. Plimpton also began the manufacture of forks in connection with hoes, and he with his sons, under the firm name of E. Plimpton & Sons, is still engaged in their manufacture at Litchfield. They employ about eighty men in the different departments of their works, but although visiting them, and making a courteous request for information in regard to the extent of their business, I succeeded in getting no satisfactory reply to my queries.

In 1840 Mr. R. B. Dunn commenced the manufacture of scythes at North Wayne, which he continued to carry on until 1850, when he sold out his interest to other parties. In 1857 he purchased the West Waterville Scythe Works, put them in thorough repair and has ever since been engaged in this business. Subsequently the company was re-organized and is now known as the Dunn Edge Tool Company, whose shops are located at West Waterville and Fayette—the latter of which, I believe, is owned entirely by Mr. Dunn. The company manufacture annually 144,000 scythes, 24,000 axes, 10,000 hay and straw knives, 6,000 corn knives, and 6,000 grass hooks. Total value, $200,000. The works give employment to one hundred men. A new workshop was erected in 1857, and the company have facilities for their work unsurpassed in New England.

Hubbard, Blake & Co., at West Waterville, employ thirty men in the manufacture of scythes and axes, making 3,000 dozen of the former, and 2,000 dozen of the latter, annually. Total value, $50,000.

Benjamin & Allen, West Waterville, employ twenty-five hands in the manufacture of agricultural implements, such as threshing machines, horse rakes, corn shellers, cultivators, &c., &c. I am unable to present statistics of this firm.

The Ellis Saw Company, West Waterville, manufacture wood, circular, mill and hand saws.

At the village of North Wayne are located the extensive works of the North Wayne Tool Company, the buildings of which cover nearly one and a half acres of ground. The company employs seventy-five men, and turn out annually about 12,000 dozen scythes, 5,000 dozen axes, 6,000 dozen hay and straw knives. Total value, $75,000.

Mr. Luther Whitman has an extensive manufactory of agricultural tools and machinery at the village of Winthrop. The different branches of the works comprise a saw mill, foundry, machine shop and carpenter shop, and give employment to sixty-five men. The saw mill cuts out annually, for the use of the wood shop, about 300,000 feet of lumber, and the yearly capacity of the works is as follows: 2,000 horse rakes; 500 dozen drag rakes; 60 threshing machines; 600 cultivators; 200 plows—aside from corn shellers, hay cutters, farm wheelbarrows, &c. Total value, $150,000.

Cotton Goods. The Kennebec Mill at Augusta, which commenced operations in 1846,* is now owned by the "A. & W. Sprague Manufacturing Company," giving employment to one hundred and seventy-five operatives, one hundred and twenty-five of whom are females. The yearly capacity of the mill is 2,400,000 yards of sheetings, valued at about $275,000.

The mill of the "Hallowell Cotton Manufacturing Company," at Hallowell, is run by steam power. It was built in 1844, and enlarged and repaired in 1866. Employment is given to two hundred hands. The goods manufactured are fine jeans and fine sheetings. When in full operation 20,000 yards of the former will be manufactured per week, or 1,000,000 yards a year; and 15,000 per week or 750,000 per year of the latter, 40 inches wide. Total annual value, $350,000.

The "Winthrop Mills Company," at Winthrop, manufacture five hundred pounds of cotton warps per day, giving employment to twenty-five operatives.

J. R. King, North Monmouth, manufactures tape and webbing, giving employment to eighteen operatives, and turning out 15,000 gross annually. Total value, $45,000.

Thomas L. Stanton, North Monmouth, manufactures about 13,000 gross of boot webbing yearly, employing sixteen hands. Total value about $40,000.

Woollen Goods. The works of the "Vassalborough Mills Company" at North Vassalborough, are the most extensive in the county or State devoted to the manufacture of woollen goods. Three hundred operatives are employed, of which number one hundred are females. The cloth made consists of the finest broadcloths, cassimeres, doeskins and beavers; and the fact is well

* A cotton factory was built at Gardiner as early as 1811, by an incorporated company. It manufactured cotton yarn, and was one of the earliest, as well as most celebrated cotton mills in the country. *Hanson's History of Gardiner, page* 339.

known that it was to this establishment that the first prize for goods of this class was awarded by the World's Fair at London in 1851. The annual capacity of the mill is 560,000 yards of goods, valued at about $800,000. The wool consumed is chiefly that produced in South America, and in the process of manufacture one-eighth part of American—western—wool is mixed with it. It is found that in cleansing, the former shrinks thirty-two per cent., and the latter fifty-seven per cent., and upon an average, two pounds of wool are required for one yard of cloth. Eight thousand pounds of wool are consumed daily. This mill is without doubt the most complete and best appointed woollen mill in New England, and the goods have, deservedly, a high reputation.

There is a building in Winthrop which, until the rebellion, was used as a cotton factory, but during the war it remained idle, and in 1865 was converted into a woollen factory, and is now operated by the "Winthrop Mills Company." It gives employment to one hundred operatives, and manufactures from 110,000 to 120,000 blankets annually, the value of which is from $250,000 to $300,000. The wool used is chiefly of domestic production.

The Readfield Woollen Manufacturing Company, whose works are situated near the village of Readfield Corner, manufacture annually about 75,000 yards of woollen cloth, giving employment to thirty-five operatives.

I. N. Tucker & Co., Gardiner, employ forty hands in the manufacture of cassimeres, flannels and satinets, to the value of $120,000 annually.

The Manufacture and Repair of Cars. The repair shops of the Portland & Kennebec Railroad Company are located in Augusta, and give employment to ninety men in the various departments of the works. During 1866, forty-seven new freight cars were built, and 236 repaired. Twenty-five passenger cars were repaired, three passenger cars of the old pattern altered into "Monitor" topped cars, and two saloon or baggage cars built. One locomotive was entirely rebuilt, and extensive repairs made upon others. The amount expended for labor and stock in 1866, in these shops alone, was $93,924.28.

The repair and machine shops of the Maine Central Railroad are situated at Waterville. In 1866, thirty new freight cars were built, several passenger cars were altered, and a new smoking car built in addition to the other usual repairs. Seventy men are employed, and about $70,000 was spent for labor and materials at the shops in 1866.

Paper. A paper mill was erected at Gardiner in 1812. Hanson says it was built by John Savels, but was burnt in about a year, and was again rebuilt within sixty days after it was destroyed. George Savage was also engaged in the manufacture of paper in Gardiner as early as 1813. George Cox, who is now living, was one of the first in Maine to manufacture paper, for a time making it in Gardiner, and afterwards in Vassalboro', where he now resides. In 1823 paper was made in Gardiner by Springer & Moore, d I am informed it was the only paper mill in the State at that time. At present the following firms in Kennebec county are engaged in this business :

J. S. Monroe, Waterville, employs twenty hands, and manufactures annually 900 tons of roofing paper, which is made wholly from straw and woollen rags. Total value, nearly $100,000.

Stanwood, Tower & Co., Gardiner, employ about fifteen hands, and make annually about 400 tons of paper of a quality suitable for mill wrappers and paper hangings. It is made wholly from wood. Total value of product, $75,000.

Richards & Co., Gardiner, employ seventy-five hands, making annually printing paper to the value of $400,000.

S. D. Warren (Copsecook Paper Co.) employ thirty-eight hands, and manufacture annually printing paper to the value of $175,000.

Oil Cloths. In 1831, Alton Pope commenced the manufacture of oil cloth table covers at the village of Hallowell Cross Roads, now Manchester. This was the commencement of the oil cloth manufacture in Kennebec county, which has since attained so much importance. About 1833, Mr. Pope engaged in the manufacture of floor oil cloths, and went into company with Alden Sampson. Mr. A. Lewis commenced the same business in 1835, and continued in it some years. In 1861, the extensive buildings of Alden Sampson & Son at Manchester, were consumed by fire. The following statistics show the extent of this business as at present carried on in the county :

The Brothers Bailey, Winthrop, manufactured in 1866, 659,239 yards of floor oil cloths, valued at over $400,000.

Jones & Co., Winthrop, employ forty men, and made in 1866, 377,685 yards of goods, valued at $205,370.

Alden Sampson & Sons, Hallowell, print their oil cloths wholly by machinery, and the firm holds the patent for the machine which is very similar to a common paper printing press with such modifications as would be necessary to print a series of impressions on

a strip of paper, and in different colors. The number of employés is thirty-eight, and the product of cloth about 50,000 square yards per month.

Stickney, Page & Co., Hallowell, employ about twenty men, manufacturing annually, product estimated at $100,000.

The following table gives a summary of other manufacturing operations in the county, of less magnitude than those above named, and closes this exhibit of the industrial operations of the county other than farming, as at present existing:

Name of Firm.	Location.	Articles manufact'd.	No. hands employed.	Annual value of product.	Remarks.
Thomas Lambard, .	Augusta,	Foundry, and Car manufac.	35	$50,000	
E. C. Coombs, . .	"	Excelsior,	3	5,000	
J. W. Longfellow & Co.	"	"	3	3,000	
A. Cowee & Son, .	"	Furniture,	18	20,000	
David Knowlton & Son,	"	"	4	2,000	
J. Bachelder & Son,	Waterville,	"	7	10,000	
Atwood & Parker, .	"	Leather,	7	–	Dress 8,000 hides a year.
Hamblin & Farr, .	"	Shirts,	125	25,000	Female hands employed.
Webber & Haviland,	"	Foundry,	12	–	Manuf. 300 plows a year.
Charles A. Wing, .	Winthrop,	Boots & Shoes,	30	15,000	
J. R. Nelson, . .	"	"	–	11,000	[ally.
John Holland, . .	Hallowell,	Clothing,	40	–	Makes 13,000 coats annu-
J. W. Clarke, . .	"	"	25	–	" 12,000 " "
Bodwell & Wilson, .	"	Granite,	50	100,000	
Stickney & Page, .	"	Plaster,	3	2,500	
Stickney & Page, .	"	Whiting,	8	3,500	
I. F. & G. B. McClinch,	"	Machinery,	5	15,000	
George Fuller, . .	"	Foundry,	5	15,000	
L. C. Stockin, . .	Monmouth,	Shoe Pegs,	5	8,000	
Thomas L. Stanton,	"	Shov'l handl's	–	–	Manuf. 8,000 doz. annu'ly.
—— Johnson, .	Wayne,	"	10	40,000	
J. B. Turner, . .	"	Doors, &c.,	2	8,000	
Estes Brothers, . .	Vassalboro'	Boots & Shoes,	25	25,000	
Tarbell & Bellmore,	"	"	–	15,000	
Nichols & Prescott,	"	"	12	5,000	
F. D. Dunham & Son,	"	"	25	16,000	
H. Pishon & Son, .	"	Tannery,	4	8,000	Dress 1,000 hides ann.
Gibson & Cushman,	"	Clothing,	100	50,000	
H. L. Butterfield, .	"	Shov'l handl's	–	–	Manuf. 12,000 doz. ann.
Coates & Pierce, .	"	Tannery,	–	16,000	Dress 2,000 hides ann.
Joseph H. Allen, .	"	Wheel Hubs,	6	4,500	
Joseph H. Allen, .	"	Excelsior,	6	7,500	
Wentworth & Brother,	Gardiner,	Car'ge Springs	6	15,000	
Elbridge Berry, .	"	Axes,	5	7,500	
Charles Swift, . .	"	Paper Boxes,	12	10,000	Girls chiefly employed.
R. W. George, . .	"	Wash. Mach.	–	5,000	400 machines made ann.
P. C. Holmes & Co.,	"	Foundry,	28	45,000	
Atwood & Howland,	"	Wat'r Wheels,	–	8,000	
James Nash, . .	"	Furniture,	–	8,000	
Morgan & Wadsworth,	"	"	12	12,000	
Gardiner Plaster Mill,	"	Plaster,	3	7,000	[annually.
J. B. Nutting, . .	"	Flour,	6	–	Manuf. 40,000 bush. wheat
Alden Baker, . .	"	Soap, &c.,	4	7,000	

CHAPTER VIII.

The Harvest of Ice.

The business of securing a crop of ice from the Kennebec river in this county, has within the past half dozen years largely increased, and has already become an important branch of industry—so much so, indeed, that one firm engaged in the business, alone employs in the transmission of its crop of ice to southern ports, more than double the tonnage used for lumber and all other shipments on the river. The extent of the business certainly demands some notice in a work of this character.

It has been estimated that two millions tons of ice are now obtained, each year, from the rivers and ponds of the northern States. The larger portion of it is consumed among our own people, but probably not less than five hundred thousand tons are shipped to the more extreme southern part of the United States, and to Europe. This State affords superior facilities for producing ice of the best quality, and for conveniently storing and shipping it, giving those engaged in the business, advantages not possessed elsewhere. During the last winter (1866–7) about forty thousand tons of ice were harvested and stored for shipment in this county. Those most largely engaged in this business are Daniel Cheesman of Farmingdale, and the Kennebec Land and Lumber Company of Pittston, opposite Gardiner. Mr. Cheesman (formerly Cheesman & Marshall) has been in the business some years, was the first I believe, to engage in it to any extent in this county, and during the late rebellion furnished nearly all the ice used by the U. S. government in the hospitals, &c. He has furnished me the following account of the processes of cutting and storing the ice, which will be read with interest:

"Our Ice House is situated at Farmingdale, on the west bank of the Kennebec river. It is 240 feet long, 165 feet wide, and 30 feet high, divided into four apartments, the whole covering about one acre of ground, and containing 1,200,000 cubic feet, with a capacity for storing 30,000 tons ice. The outside walls are double boarded and filled with sawdust twelve inches thick from the sills to the plates. The partition walls are ten inches thick, filled in like manner with sawdust. As soon as the ice is sufficiently strong to be safe to go on with teams, the ice is staked off. It requires thirty acres of ice twelve inches thick to fill our ice house. We usually keep the snow scraped off from about eighty acres to

insure us a sufficient field to work upon. The scraping often costs twice as much as it does to cut and store the ice. As soon as the ice is from 12 to 14 inches thick, the process of marking out and cutting canals commences.

In the first place the canal through which the ice is floated to the foot of the elevator is marked out and cut, on a line with, and of the same width as the elevator, to a proper distance in the river, so as to intersect the large canal running parallel with the river. This canal is about 40 feet wide, and often one-half mile in length, reaching to the point where the ice is being marked and cut. A machine called a marker is first used to mark the ice in blocks 22 by 44 inches. This is drawn by a horse, and cuts the ice three inches deep. It is followed by a machine called a cutter, also drawn by a horse. This cutter will cut the ice twelve inches deep. It is then barred off in large cakes, containing from five to fifty tons each, and floated down the canal to near the ice house, and then separated into small blocks, 22 by 44 inches each. These are floated along to the foot of the elevator, where a man is stationed to place the blocks of ice, two or three abreast upon the elevator in front of the cross bars attached to the endless chain, (one in every nine feet). The chain is 600 feet long, revolving around the driving wheels placed in the tower at the top of the elevator, and passing around two large wheels at the bottom of the elevator, and placed an equal distance apart with the driving wheels above. The whole of this machinery is worked by a twenty horse power steam engine.

The ice leaves the elevator through a door at about six feet high from the bottom of the ice house, discharging the ice on runs leading into each of the four buildings of sufficient descent to allow the ice to pass unassisted to the extreme end of the house, 240 feet from the main centre run. The ice is switched off into each of the buildings by only a single switch tender. As soon as the ice house is filled up even with the first set of runs, the first door is closed on the elevator, and the ice is carried up six feet higher and discharged on the next set of runs, in every way similar to the first, and so on every six feet, until the building is full. Twenty men are employed in the building to store the ice. Twenty-five blocks per minute, or about 2,000 tons per day, is a fair day's work at our establishment. The number of men and horses usually employed in cutting, scraping and handling the ice is about one hundred and fifty per day, during the winter months.

The ice is all carefully covered with sawdust and shavings, and every attention paid to keeping it in good order for shipping. As soon as the ice is out of the river and navigation resumed we commence shipping the ice and employ some sixty men until late in the fall. Our shipments are made to New Orleans, Natchez, Pensacola, Mobile, Beaufort, S. C., Charleston, Wilmington, Savannah, Baltimore, Point Lookout, Portsmouth, Va., Norfolk, Washington, New York, Philadelphia, and nearly all points where ice is used. It is said that our firm employs more than double the tonnage used for lumber and all other shipments on the Kennebec river. The expenses of sawdust and shavings alone used in the packing of the ice, is no very small item of expense."

In the autumn of 1866, Mr. Ira D. Sturgis of Augusta, purchased the well known Williamson farm in Pittston,* opposite Gardiner, and in October commenced the erection of three ice houses, near the bank of the river, which were completed in season to store the ice crop of 1866-7. The aggregate width of the Company's ice house is 240 feet, 100 feet long and 28 feet in height, joined together, and with the means of opening into each other when required to load the ice upon vessels lying alongside. They are built with double walls on every side, the spaces being filled with sawdust to make the buildings air-tight, and to keep the interior at the lowest possible temperature. The three roofs are also furnished with ventilators for the escape of the warm air generated within the buildings. Attached to the south end of the buildings is an elevator which raises the blocks of ice from the river, by means of an endless chain upon an inclined plane, to three separate landing places of different elevations, thence giving the ice an impetus which carries it along a wooden railway 240 feet in length, and delivers the blocks alternately upon other inclined planes leading into each of the buildings, where they are stowed in superincumbent layers until the building is filled. The elevator is moved by a Corliss horizontal engine of thirty horse power, and the regularity and celerity with which it works will be realized by the statement that these blocks of ice, weighing 600 pounds each, are thus raised and delivered and stowed in the buildings at the rate of sixteen per minute, or one thousand per hour. Five or six men are required in each building to receive the ice and stow it properly.

* Since passed into the hands of the Kennebec Land and Lumber Company, of which Mr. Sturgis is the Superintendent.

The entire cost of the buildings and machinery at this establishment, including the steam engine and the erection of piers for the accommodation of vessels, is estimated at about $20,000. Sixty men and twelve horses were employed by the Company during the season of 1866–7 in the various operations of scraping, marking, cutting, rafting and stowing. These operations are so well described in Mr. Cheesman's letter previously given, that it is unnecessary to repeat them.*

Before dismissing this matter of ice I wish to call the attention of the farmers of this county to the subject of preserving ice for their own domestic wants. It is a luxury, as well as a necessity, during the hot season to have a supply of ice, and this almost every farmer may have who will go to the expense of building an ice house, (not a great expense by any means), and be at the trouble of harvesting a crop of ice sufficient for his own consumption. Most farmers are so situated near ponds, streams or rivers, that the ice could be secured without a great deal of work, and the building of an ice house need not be a great expense. If a farmer does not wish to erect a separate building for an ice house, he can partition off a portion of his wood shed which will answer a very good purpose. In case, however, he desires a separate building for it, the same can be made ornamental and be an attraction to his farm buildings. Where a part of some other building is used, all the preparation that is necessary is to box up the inside, leaving a space of one foot between the wall, filling it with spent tan or sawdust. Before commencing to put in ice, place a layer of sawdust or tan, a foot in thickness, upon the bottom. This apartment can also be used for other purposes than storing ice, and for keeping fresh meat and fish, butter, &c., will be found a

* The following appeared in the *Maine Standard*, published at Augusta, of April 27, 1867:

"Between Augusta and Richmond, on the Kennebec, a distance of sixteen miles, there were harvested the past winter, eighty-five thousand tons of ice. It has been sold, or engaged, at an average of $2.75 per ton. Who would once have thought, that merely at the cost of taking it, two hundred and twenty thousand dollars could be gathered, in one winter, from the surface of the Kennebec river! Are there any gold mines in California richer than this? It is said by parties from New York, Boston, &c., engaged in the ice business, that no where in the United States is so good a chance to collect merchantable ice for a market, as on the Kennebec, above brackish water (Richmond) to the head of navigation, (Augusta). The ice is thick, solid and pure; may be taken by machinery directly into the houses on shore, and loaded therefrom, by the same simple machinery, into vessels at the wharves on which the ice houses are erected. One house in Farmingdale has made an actual profit of forty thousand dollars by the ice now in it."

great convenience and much better for this use than a cellar under the house.

It is not necessary that the upper part of a building used for an ice house should be tight; on the contrary it should be open so as to admit of free ventilation. The lower part of an ice house needs to be close and tight, but as evaporation takes place only from the surface of the ice, means should be adopted for carrying off the moisture, therefore the top part should be so constructed as to allow of good ventilation.

At little expense an ice house, or an apartment serving the purpose in some building already constructed, can be provided; and in winter it can be filled with ice at small cost, so that the luxury of ice water or ice creams if wanted, can be had in the heat of summer, and I believe the farmer who will provide the same will be satisfied with the outlay.

CHAPTER IX.

Farm Economy;—Miscellaneous Matters.

A stranger passing through the county of Kennebec, either east or west of the river,—even if he was not a farmer, and had no interest in agricultural pursuits—could but be impressed with the beauty of the rural scenes and the general thrifty appearance of the county, especially in that which gives character and distinction to any town, the houses in which men live and the buildings that surround them. True, a man may have a very excellent farm and be a very good farmer, and still have indifferent or ordinary buildings upon his estate; but as a general rule the house and outbuildings of a farm are an index not only of the farm itself, but also of the management and character of the owner.

The farm buildings of Kennebec,—the dwellings, barns, stables, and other out-buildings,—are probably better, taken as a whole throughout the county, than in any other section of equal extent in the State. It is true there are in the county many small farms which require correspondingly small buildings; there are also in less favorable localities, common in every district in the State of this extent, buildings of a poorer class; but these are the exception and not the rule. The dwelling-houses upon our farms are almost invariably such as convey the impression of permanency and stability, and consequently content and happiness among the residents. By this I do not mean to be understood that no farms are

for sale in the county, that there are no dissatisfied farmers among us, that men do not sell out and give place to new comers, but that the general course of farm life is one of content and independence, and that farmers, instead of working year by year with the view of disposing of their farms at the first favorable opportunity, pursue a course of management looking to the gradual improvement of their farms and buildings, the adornment of their yards and roadsides, and the performance of whatever can make their homes more attractive and their farms more productive as a permanent abode. Consequently one finds in travelling through the county in any direction, that the houses are kept well painted and in good repair, that shade trees, flowers and vines, lend their charms to the surroundings of the dwelling, that the barns and stables are of extensive proportions, finished in a substantial, often in a luxurious manner, and provided with all conveniences for housing and tending the stock of the farm. This air of thrift, and comfort, and independence, is observable in every portion of the county. The old dwellings of the early farmers have upon most places been superseded by houses of a more modern style of architecture, though here and there the low roofed, small windowed cottage, and the large, square, two-story houses, with the front door invariably in the middle, are to be seen, bringing up recollections of the earlier days of the settlement of the county, and the hard work of our forefathers in battling with the forests and shaping from an uncultivated district the happy homes and beautiful farms of to-day.

Next to buildings, the fences of a district are the best index of its system of farm management, for they are, with general observers, more noticeable than the appearance of fields, as roadside and division fences—especially if very good or very poor—strike the eye quite as soon, if not sooner, than fields and pastures, however smooth or productive the latter may be. The fences throughout Kennebec county, with a very few exceptions, are in poor condition, and certainly do not speak much in commendation of the farmers. It is generally the case that the stone walls are those known as single wall, and these are often in a tumble-down, shiftless condition. There are but few farms well fenced with double wall, although the material for it is quite abundant in almost every town. The remark made in regard to single wall is in a great degree true of the other fences commonly found upon the majority of our farms; they are in a condition not at all in keeping with the condition of the buildings, the general appearance of the fields, and

the system of farm management in practice. Some exceptions indeed appear. As examples: Several of the best farms are enclosed with fences made of iron posts set in stone feet, and cedar rails attached to the posts by having holes bored in the ends of the rails. It is made five rails high, and forms a durable, permanent fence. A fence constructed in a similar manner, with iron posts set in stone feet, a rail suspended near the top of the post, another placed at the bottom, and pickets nailed to the rails or bars. This forms a lighter and cheaper fence, but is much liked and is quite common. A portable fence is also made of these pickets, in sections, each section being about ten feet long, and is kept upright by placing a pair of stakes at each end of a section. This fence can be moved when necessary with little trouble, an advantage that many farmers consider of much importance. I know of few more unpleasant sights upon a farm than a roadside or division wall in a rickety condition, occupying a strip of land about a rod wide, and forming a harbor for all sorts of decaying brush, old logs and noxious weeds. But I am sorry to say such sights are not uncommon in our county, and are a blot upon our otherwise commendable system of husbandry. Upon some farms, division fences, where the adjoining land is in mowing fields upon both sides, are wholly discarded, which is also the case in some towns with the road fences.

The use of improved farm implements and machines has wrought wonders in the agricultural operations of this county, as well as with all other parts of the State. Our farmers have been among the first in the State to take advantage of their aid, as notes in previous chapters abundantly prove. Indeed, without the assistance rendered by the various labor-saving machines now in such universal use in the county, it would have been completely impossible for farmers to have performed their work, especially during the years of the late rebellion, when farm laborers commanded such high prices and were almost unable to be procured. The value of farm implements in the county according to the census of 1860 was $375,864, and I venture the assertion that it is now (1867) double in amount what it was at that time. During the past seven years mowing machines have largely increased, and there are now in use within the county at least fifteen hundred mowers of the various patents. Not only have mowers increased, but horse rakes, horse hoes—which are very much esteemed and are being largely introduced—horse pitch forks, and numerous other improved imple-

ments for lessening manual labor have also been used in large numbers, and all our best farms are now well furnished with these various articles. I think one of the most instructive features at the fairs of the North Kennebec Society, has been the exhibition of complete sets of farm implements from farms within the limits of the Society. In this way, by an exhibition of the machines in actual use upon the farms much practical information in regard to their construction and uses is obtained by farmers who, no doubt, are thus induced to purchase for their own farms, some implement with which they were before unacquainted. I wish the same plan would be adopted by other societies, as I believe it would contribute largely to the interest of their exhibitions, and aid greatly in promoting the objects for which they are held. It would be an interesting subject to figure out (I prefer to suggest the matter simply, and leave its solution for my readers) the difference in the cost of raising and harvesting a crop of hay or corn with the aid of the improved implements for doing the work now used, and the cost of performing the same labor upon the same crop by the hand method of a few years since. The result would be somewhat startling, I judge, and present at a glance the real value of our improved farm machines. I will say however, that from some figures of my own I estimate the saving by the new methods to be at least two thirds.

By referring to the chapter in relation to the farm stock of the county, it will be seen that our farmers have always endeavored to obtain the best specimens of the various breeds to breed from, and I think the general knowledge they possess in regard to the principles of breeding, and the intelligence and care they have exhibited in its practical development, mark, as distinctly as anything to which I can point, the high degree of knowledge they have attained in relation to their business. And their information in regard to breeding is only equalled by that concerning the theory and practice of drainage, application of manures, and other topics relating to the various departments of farm labor. Farmers now, in the matter of breeding the various animals they have upon their farms, are, as a general rule, very careful in regard to the selection of the stock they breed from upon both sides, inquire into the pedigree of animals, and willingly pay a high price for the service of a superior animal rather than obtain those of an inferior one for nothing. It is not many years ago that the reverse of this was the practice among the generality of our farmers, but the diffusion

of intelligence has brought about this most desirable result. As an instance of the care and attention which now direct this matter of breeding among the most intelligent of those engaged in it, I may mention that one gentleman in the eastern part of the county, who has given great study to the principles of breeding, and probably has as good an understanding of the whole subject as any one in the State,* keeps at his establishment a record of every mare brought to his horse for service, including if possible a pedigree of her sire and dam, with an account of her structure, color, marks, weight, condition, how many times previously bred by, and description or name of horses bred to, with other matters of interest to breeders. This record, continued through a series of years, and embracing notes regarding the progeny of each, will form important data from which most valuable conclusions can, with some degree of accuracy, be arrived at. Among other things it will without doubt, give additional evidence to the already well established fact that to breed from stallions presenting to the eye a symmetrical form and fine size does not insure the offspring to possess fine size and symmetry, only in proportion as the progenitors, both sire and dam, for several generations may have possessed those desirable qualities. Those also who are not so extensively engaged in breeding, pursue a course highly commendable, invariably breeding from the best specimens, regarding a superior animal worth as much to their own county and State, as to any other part of the country, and also worth more to breed from than to sell. Men who are willing to breed with care and intelligence, and wait patiently for the results, thinking less of present advantage than of future benefit, are the ones to be encouraged, and all such will be sure to be appreciated, and receive their compensation. While upon this subject it may be in place to mention that the breeder to whom I have just alluded has made several thorough and careful trials in keeping horses upon cut and uncut feed, and has become satisfied that dry hay and dry grain is better for them than cut and mixed feed. It is more natural for them to masticate their own food; they perform it more thoroughly and keep in better condition upon it than by any other system of feeding. This conclusion was not arrived at but by a careful and long continued trial, and the results obtained are of great value to all who have the care of stock.

* "Breeding of Roadsters and Trotters," by Thos. S. Lang, Esq., in Report of Department of Agriculture for 1864, page 157.

Horses are used far more generally as a farm team than they were some years ago, but are not so common in the western as in the eastern portion of the county, and in the towns along the river. For many kinds of work they certainly possess advantages over oxen, as for instance the hauling in of hay and grain, and any kind of work where travel for long distances is required. But this question of the comparative advantages of oxen or horses for a farm team has been often discussed in our agricultural journals and transactions, and I do not propose to reopen it here. Both have their advantages and their disadvantages, and upon large farms they are both used. Some of our best farmers also employ mules, and consider them better, cheaper, and more satisfactory than either horses or oxen, for performing all kinds of work required of a team. They are cheaply kept, possess great powers of endurance, can be worked to a much greater age than either horses or oxen, and when kindly used are universally tractable and perfectly safe. They are worked by Allen Lambard, Esq., and Major F. Davis, on their farms in Augusta—and they are among the best farmers in the county—by the Messrs. Milliken of the same place, in hauling their lumber, and also at the Military Asylum at Togus Springs.

Many farmers in the county have been engaged more or less extensively in draining and reclaiming low and wet lands, and universally with the most satisfactory results. In such situations open drains or ditches are chiefly employed for the purpose of drainage, but stones have been used for underdraining to considerable extent. Few examples of what is termed *thorough drainage* with tile are found in the county. Upon one farm, however, in one of the river towns on the east side of the Kennebec, it has been adopted in draining a field of eleven acres of stiff clay soil, with results highly pleasing. Before being drained its produce was about one ton of hay per acre. In 1863 it was drained, and the yield in 1864 was thirty-three tons of hay, and in 1865 forty-two tons. The main drains were sunk four feet deep, and the others three feet. With the gradual reclaiming of low and waste lands in different portions of the county, the cultivable area is becoming enlarged year by year, and the profits of the farms correspondingly increased.

The products of the dairy do not form so important a feature in the rural economy of the county as would be naturally inferred from the high rank it has obtained as a grazing district. There

are more farmers who pay greater attention to the rearing of large and fancy cattle, than to the production of butter and cheese, as they think the former course is quite as profitable, while at the same time it does away with a vast amount of hard work which must be performed in-doors by the farmer's wife, or (who very rarely know how to do it right) the female help of the house. Yet notwithstanding this, the butter and cheese of the county is of superior quality, and commands a high market price. The annual amount of butter made is something over one million pounds, and of cheese, nearly 230,000 lbs.

I do not think the farmers throughout the county manage and apply the manure of their farms in so uniform a manner that any one mode of application can be mentioned as being the practice in general use. While there is among farmers a very correct opinion of the nature and effects of the various fertilizers, the modes of application are as different as the other methods of performing farm work. Each has his own way, and I presume regards his own way as best. These are so well known by all farmers that I regard a particular description of the various methods unnecessary. Commercial manures, such as the different brands of super-phosphates, guano, lime, &c., have been very largely used within the past half dozen years, and immense sums of money have been sent out from our county annually for the purchase of these fertilizers. I judge they are regarded as a profitable investment, or their purchase and use would not be kept up to the extent it is. A farmer must procure manure for his land or it will cease to reward him with bread. How this manure shall be obtained is a question for each farmer to decide for himself. If his farm stock does not produce a sufficient amount, resort must of course be had to other sources. But I desire to impress upon the farmers of the county this one important fact: the manurial resources of each farm must not be overlooked and regarded as of no account, and their means for adding to the fertilizing matter for the land abandoned, while money is paid out for special fertilizers brought from abroad, which money must come from off the farm from the sale of some of its products. The plan must never be countenanced. The home resources of the farm, (and they are many,) must be looked to for the supply of the fertilizing material for growing its crops, and these resources, if judiciouly husbanded, are amply sufficient upon almost every farm to provide all the compost needed, and render unnecessary the purchase of concentrated manures.

The county of Kennebec is by no means a well wooded district. There are many tracts of heavy timber in some localities, but the due proportion is wanting, and it will do no harm to suggest for the future a more careful attention to the wood and timber lots. Cord wood, or wood prepared four feet long, as it reaches our markets, has commanded so high a price during the past four or five years (it has ranged from $7.00 to $10.00 per cord in the market at Augusta) that many farmers not before accustomed to sell wood have been induced to prepare considerable for market, and a large proportion of that found in the market in this city is hauled from eight to ten and even thirteen miles. Greater care must be extended to our forests, or wood will command a much higher price than that stated above. This care must be exercised as well in trimming and pruning our forest trees and in the careful cutting out of the old and decaying ones, as in the planting of seeds of wood and timber trees, or at least allowing some of the rough and quite unproductive pastures to grow up to wood again. The best informed arboriculturists in the country conclude that wood-lots can be cut off to advantage once in twenty years, and that the amount of wood furnished by an acre of the ordinary hard wood varieties, is from thirty-six to forty-five cords. Forests serve as reservoirs and equalizers of humidity; in moist weather the decayed leaves and spongy mould retain a considerable amount of falling rain, and in dry weather give back moisture by evaporation or through the medium of springs and brooks. Wherever the hillsides are cleared of their growth of trees, large quantities of the richest soil are carried down by the floods into the streams and rivers, and consequently the land becomes barren. By a careful economy in preserving the growth upon these hillsides, much of this waste and attendant barrenness can be prevented. Forest trees add so much to the beauty of the rural scenery that they should for this if for no more weighty reason, be carefully preserved, and if consistent, new plantations formed in such localities as have been heretofore stripped of them.

Bees are a source of considerable profit to many farmers, who keep them, not as a direct source of income, but as an auxiliary to their other branches of labor. The instances are few, however, where a honey crop is specially sowed for them,—although buckwheat is occasionally sown in part as feed for bees and in part for the grain it yields,—and their main dependence is generally from the clover in the fields and other natural honey producing plants. I have

been informed of clear profits of from $20 to $65 in honey during one season, the produce of from six to a dozen swarms, besides that consumed for family use by the parties. This branch of industry can be largely extended throughout the county without being overdone.

As I have been travelling over the county for the purpose of becoming acquainted with its agriculture, and of collecting notes and materials which have been embodied in the little work now presented to the farmers of Kennebec, several matters have been suggested to me in the way of improvements, that if carried out would not only render the rural economy of the county more commendable as a system, but also contribute materially to the profits of the farms, which I venture to bring to their attention in this place, hoping that some of them will be put in practice:

1. The drainage of stiff, clayey lands, and generally of land troubled with excessive moisture.

2. A general practice of top-dressing mowing lands in autumn, using for this purpose fertilizers best adapted to the soil, such as lime, ashes, plaster, super-phosphate, weathered meadow muck and barn-yard manure.

3. The planting of new orchards to take the places of the old ones so fast going to decay.

4. The removal of stumps, boulders and stone heaps from mowing fields, using the first as a material for fencing or fuel, the second for feet of picket fence, and the third for the construction of good, durable wall or under-drains.

5. The improvement of pastures by draining them if they require it, but especially by keeping down weeds and scrubby bushes by the use of the bush scythe and grub hoe.

6. The planting of ornamental trees by the roadsides and about dwellings.

7. The building of better fences, especially road and division—on lines between farms.

8. The adoption of a regular system of rotation of crops, of which the following is given as a specimen course: First year, potatoes; second year, corn; third year, barley or wheat, and seeded; fourth year, clover and herdsgrass for three years.

9. Greater attention to furnishing dwellings, barns and farmyards with pure water, either by introducing it in pipes from springs, or providing wells and pumps.

10. The utilization of the waste from woollen factories, tanneries, wool-pulling establishments, and slaughter-houses.

APPENDIX TO REPORT ON KENNEBEC COUNTY.

I.—Summary of Agricultural Statistics of Kennebec County, from the Report of the Eighth Census, 1860.

Land:	
Acres of improved,	285,393
Acres of unimproved,	164,960
Cash value of farms,	$8,858,355
Cash value of farming implements and machinery,	$375,864
Live Stock:	
Horses,	6,817
Mules,	8
Milch cows,	14,664
Working oxen,	7,854
Other cattle,	13,197
Sheep,	43,552
Swine,	5,760
Cash value of live stock,	$1,637,826
Agricultural Productions:	
Wheat, bushels of,	8,821
Rye, bushels of,	6,726
Indian corn, bushels of,	229,460
Oats, bushels of,	240,077
Wool, pounds of,	140,802
Peas and beans, bushels of,	22,481
Potatoes, bushels of,	565,304
Barley, bushels of,	151,540
Buckwheat, bushels of,	4,099
Orchard products, value of,	$77,054
Wine, gallons of,	562
Garden products, value of,	$17,201
Butter, pounds of,	1,228,721
Cheese, pounds of,	223,655
Hay, tons of,	107,511

Summary of Agricultural Statistics, (Continued.)

AGRICULTURAL PRODUCTIONS—*Continued.*	
Clover seed, bushels of,	329
Grass seeds, bushels of,	125
Hops, pounds of,	2,382
Flax, pounds of,	165
Maple sugar, pounds of,	3,344
Maple molasses, gallons of,	2,445
Beeswax, pounds of,	728
Honey, pounds of,	25,636
HOME-MADE MANUFACTURES:	
Cash value of,	$26,491
ANIMALS SLAUGHTERED:	
Cash value of,	$286,111

II.—RESTOCKING OUR RIVERS AND PONDS WITH EDIBLE FISH.

The Legislature of the State at its session in 1867 passed a resolve making an appropriation for the appointment of Fish Commissioners to examine the various rivers in the State and report upon the practicability of opening them to our fresh water fish; and also of engaging in the artificial propagation of certain kinds of fish. The Commissioners appointed were N. W. Foster of East Machias, and Chas. G. Atkins of Augusta, and I have rarely known public officers to bring to the duties of their position better qualifications, or to enter upon the discharge of those duties with more earnestness and a desire to do the greatest good possible. During the summer of 1867 they made a thorough examination of all the principal rivers in the State, and I am informed that their report, which will be presented to the Legislature the present winter (1868), will show that the restocking of our rivers is a matter entirely practicable, and can be done at a comparatively small expense by the construction of fish-ways over the dams, on the plan devised by Mr. Foster, which have been in successful use for several years upon the dams on some of our eastern rivers. I feel assured the time is not far distant when this matter will receive the fostering support and protection of the State, and that judicious laws, with proper officers to see them duly executed, will regulate everything pertaining to so important a subject. The report of the Commissioners will be one of great interest and value.

The *Eastern Mail,* published at Waterville, in noticing the first part of this work, thus speaks of the enterprise of Mr. Abijah Crosby of Benton, in endeavoring to propagate fish in the waters of Kennebec county:

"Mr. Crosby—a Christian hero, if there ever was one—had a broader idea and had entered upon a greater work than our historian gives him credit for. He started with a determination to re-open the Kennebec to the ascent of the fish that once frequented its upper waters, and which he was confident would do so again, if a properly constructed fish-way—such as was stipulated for in the charter—could be built at Augusta; and having faith that the Fish Commissioners would do their duty and enforce the law, he transported large numbers of shad and alewives to the ponds and streams above, feeling sure that their progeny would in after years find their way back to their birth-place. But the war came; and our friend Crosby—no monomaniac, no man of one idea, as many supposed, but a sagacious, large-hearted man—although exempt from military duty by reason of his age, felt called upon, in a dark period of the contest, when men hung back in dread, to step forward, the first volunteer in his town under that draft. Mr. Crosby may have transported other fish in a small way, but his main work was as we have stated; and he left the State with a promise from Governor Coburn and other officials, that his great enterprise should not be neglected. He was faithful even unto death; they best know how their pledges were fulfilled."

III.—Slate in Winslow.

In 1866 a slate quarry was opened on the Stratton farm in Winslow, concerning which the following appeared in the *Kennebec Journal* in August of that year: "The quarry is located upon one of the ravines emptying into the Sebasticook river, and the same has been wrought with good success, the slate being of good rift, of hard texture, free from foreign substance and of a fine blue-black color. The slate has been quarried about forty feet long, twelve feet wide, and eight feet deep, from the whole bulk of which excellent merchantable slates have been easily split and put in shape, and can take the first rank for quality in any market in the country. This quarry crops out about three hundred feet from the bank of the river and about seventy feet above it. The seams, uninterrupted by any quartz or hard rock, are about three feet wide,

while the intermediate hard rock veins are only a few inches in width. This location of the quarry gives to the operators a declined plane for conveying the slate to the bank of the river, where it may be taken into large boats for transportation to the cities on the Kennebec, or to ship navigation at Bath. The location of the quarry is every way fitted for the successful prosecution of the slate business at a point where, with little expense of transportation, it may supply the local market and furnish a large amount for shipment." I have obtained specimens of the slate, but fear the particles of iron which enters into its composition are sufficient to cause it to corrode when used for roofing purposes. If so, it will materially depreciate its value for this use.

IV.—Abstract of a Meteorological Register, kept at W. Waterville for 1863, 1864, 1865, 1866 and 1867.

BY B. F. WILBUR.

Showing the highest and lowest range of the thermometer, (with dates prefixed,) the mean temperature, and amount of rain and melted snow, (in inches and tenths,) for each of the calendar months; also mean cloudiness and mean force of the wind, together with the number of entire cloudy and clear days. The column of cloudiness is reckoned 10 for entire cloudiness, and 0 for entire clearness. So also of the force of the wind, 10 for the highest or strongest wind, and 0 for a perfect calm.

	Dates.	Maximum Temp.	Dates.	Minimum Temp.	Mean Temp.	Amt. of rain and of melted snow.	Mean cloudiness.	Mean force of wind.	Days of entire cloudiness.	Days of entire clearness.
1863.										
August,*						3.45	5.5	1.67	4	0
September,*						2.85	5.	1.61	8	3
October,*						4.55	5.9	1.47	9	3
November,*						3.75	6.54	1.87	6	1
December,*						3.4	5.61	1.77	6	2
1864.										
January,	24	45°	8	—5°	22.41°	3.65	5.11	1.78	7	1
February,	7	46	19	—21°	25.63°	1.6	6.32	1.45	5	2
March,	5	54	22	10	33.17	3.95	5.2	1.92	5	1
April,	25	60	12	28	41.17	2.7	6.12	1.63	5	4
May,	31	75	3	42	55.78	3.05	7.89	0.92	13	0

* Records imperfect.

Abstract of a Meteorological Register, &c., (Continued.)

	Dates.	Maximum Temp.	Dates.	Minimum Temp.	Mean Temp.	Amt. of rain and of melted snow.	Mean cloudiness.	Mean force of wind.	Days of entire cloudiness.	Days of entire clearness.
1864.										
June,	25	90	8	45	65.73	0.55	4.66	1.1	2	1
July,	20,31	88	22	58	70.83	1.35	4.34	1.52	1	2
August,	1	93	31	57	68.65	3.9	5.72	1.16	7	1
September,	1	76	22	40	56.07	3.25	6.33	1.64	4	0
October,	7	66	30	28	44.48	2.6	6.63	1.45	3	0
November,	10	58	17	18	35.75	4.85	6.46	1.47	8	1
December,	1,7	44	23	—9	22.92	3.6	6.93	1.44	8	2
1865.										
January,	13	35	28	—13	14.66	4.9	6.01	1.37	4	0
February,	26	46	12	—12	21.14	2.4	5.7	1.53	7	2
March,	29	51	7	4	33.5	4.5	6.59	1.59	8	1
April,	27	73	9	30	44.52	4.1	5.96	1.72	4	2
May,	17	80	7	37	54.92	2.8	6.61	1.58	1	1
June,	30	90	3	52	67.75	1.35	5.47	1.58	1	1
July,	28	86	31	54	67.73	5.55	6.12	1.42	2	1
August,	4	91	24	50	67.38	1.1	4.48	1.35	1	0
September,	14	86	28	40	63.76	0.57	4.55	1.26	2	5
October,	1	70	31	22	44.44	3.35	5.44	1.5	3	0
November,	17	61	11	19	36.36	3.4	6.64	1.4	4	0
December,	13	46	22	—6	34.05	3.25	6.05	1.22	6	0
1866.										
January,	1,18	40	7	—23	14.98	3.39	5.15	1.69	6	5
February,	24	48	7	—14	21.2	4.9	6.15	1.55	9	3
March,	28	47	18	8	28.05	5.5	6.93	1.76	10	0
April,	22	69	2,11	34	45.15	2.15	5.93	1.44	4	1
May,	12	80	1	37	53.42	3.35	5.24	1.6	4	1
June,	26	89	1	50	64.47	4.3	5.84	1.61	5	0
July,	7,17	91	19	58	72.19	2.9	5.25	1.34	1	1
August,	12,13	80	16,24	54	64.39	4.8	5.58	1.66	0	0
September,	3	80	24	42	59.66	5.2	5.33	1.2	6	2
October,	8	72	26	22	48.12	3.1	4.74	1.53	2	4
November,	30	58	26	20	39.03	2.64	5.87	1.73	3	2
December,	5	48	30	—9	25.62	3.37	5.31	1.57	7	2
1867.										
January,	22	37	20	—14	13.96	3.7	5.67	1.84	8	3
February,	14	49	21	0	25.53	3.2	5.84	1.7	5	2
March,	31	52	16	—2	28.02	4.55	5.73	1.85	6	2
April,	20	67	13	29	41.37	3.42	6.25	2.2	6	0
May,	28	71	4	34	51.59	4.87	7.24	1.79	7	0
June,	22,30	82	7,10	52	66.63	1.65	5.06	1.93	4	1
July,	24	90	19,20	52	68,23	3.7	5.54	1.87	4	2
August,	18	86	31	51	70.32	6.9	5.9	1.64	4	2
September,	4	75	30	35	58.23	0.87	5.25	2.31	5	5

V.—The Vaughans.

In Chapter VII of the first part of this work, I gave some account of the Messrs. Vaughan, who were very active promoters of the agriculture of the county and State in the early part of the present century, but did not give so full a sketch of Charles as of Benjamin, because I could not then ascertain the necessary facts. Some of these I am now able to supply. Charles Vaughan was born in London, England, June 30, 1759, and spent the early part of his life in commercial pursuits at Jamaica, West Indies, where his father owned a plantation. He came to Hallowell about 1795. "His elder brother, Dr. Benjamin Vaughan, was, during the Revolutionary war, a member of Parliament, but friendly to America, contracted an intimate acquaintance with Franklin when Minister at Paris, and admired the character of Washington. When our Constitution was adopted, and our government established on a firm basis, with Washington elected President the second term, he determined to leave the land of his nativity, the honors and trappings of royalty, and come to our free country and spend the remnant of his life in retirement at Hallowell, 'on the banks of the beautiful Kennebec,' with a sister, who married John Merrick, an accomplished scholar."*

The head gardener to the Vaughans at Hallowell was Mr. John Hesketh, who came to this country in 1797. Before coming to America he was for many years the head gardener to Lord Derby, and had the entire charge of his grounds at Knowesley Hall, eight miles from Liverpool, Derby's country seat. On coming to America, Mr. Hesketh was employed as gardener to Dr. Cragin at Cambridge, Mass., for two years, and then came to Hallowell, in the employment of the Vaughans, where he died several years since, at the age of 75 years. His knowledge of fruits, plants and flowers, and of the principles of landscape gardening was very thorough for his time, and he imported, personally, many plants and seeds from England. Several of his descendents are now living in Hallowell. Charles Vaughan died May 15, 1839, aged 80 years. In the Maine Farmer of Feb. 7, 1867, William Allen, Esq., of Norridgewock, gave a sketch of Charles Vaughan, from which I am tempted to make an extract:

"He obtained the best breed of swine, and distributed pigs and calves of choice breeds to farmers in all directions, procured the

* William Allen, Esq., of Norridgewock.

best of English scientific publications, with drawings and engravings of different classes of neat stock, with ample descriptions of the class best for the dairy and that best for the plow. Our common farmers brought up on farms, were generally then prejudiced against 'book farming,' but farmer Wingate of Hallowell, Robert Page of Readfield, Samuel Wood and Elijah Wood and Steward Foster of Winthrop, and many other intelligent farmers, gladly availed themselves of the information Mr. Vaughan could give, and their orchards were soon renovated with scions of good fruit obtained from him, and their stock so much improved as to do away the prejudices against 'book farming.' Mr. Vaughan was always highly gratified with the success of others, and would take no compensation for his personal efforts, and when he had a choice animal to spare charged nothing extra for it above the usual price. Being at Hallowell in 1807, by invitation I went with a party to see 'the farm.' We found everything about the farm and garden in the most perfect order; a young orchard looking finely, the cherry trees full of ripe cherries, and plum trees and shrubbery all looking well. He showed us the engravings of his choice stock, and described their good qualities, and the company came away delighted and much instructed by the interview. When the Somerset Agricultural Society was formed, in 1820, he sent me a thousand scions of choice fruit for gratuitous distribution, with notice that individuals who wished to improve their stock might have access to the progeny of his best. I am confident that in this way Mr. Vaughan, during the first quarter of the present century, did more than any other man to promote the farming interests in the State."

When the late Dr. Parker Cleveland, who has been called the "Father of American Mineralogy," published his "Elementary Treatise on Mineralogy and Geology," in 1816, it was dedicated to Dr. Vaughan in the following words:

"To Benjamin Vaughan, LL. D., Fellow of the Royal Society of Edinburgh, of the American Philosophical Society, of the American Academy, of the Mass. Medical Society, etc.: Sir,—You will not, I trust, be displeased, and the public, I am assured, will not be surprised, that I should embrace this favorable opportunity of addressing you, as the patron of general literature, and more especially of Natural Science. It is, indeed, an elementary treatise only which is here offered to your notice. But it is no small encouragement to those who are anxious to promote the progress of Mineralogy and Geology, to know that these branches of knowl-

edge receive the patronage and attention of such as have, like yourself, devoted a large portion of life to the cultivation of deeper and more abstruse sciences. Accept, dear sir, for your friendship both to myself and the College with which I am connected, these sincere expressions of gratitude and respect."

VI.—Jesse Robinson.

In a foot note on page 79 Part First, I stated in reference to the bull kept at Pittston about 1830 (got by Young Denton or Cœlebs), whose owner's name Mr. Howard did not know: "It was probably General Jesse Robinson, who afterwards removed to Waterville, where he died." This statement is corrected in a number of the *Eastern* (Waterville) *Mail* of a subsequent date, as follows: "Mr. Boardman falls into an error in regard to General Jesse Robinson. He is yet alive (1867), with a clear and vigorous intellect, at the age of 95. He thinks that no bull was located at Pittston, as Mr. Sanford Howard writes; but from a circumstance that he remembers, he thinks the "Kezer bull" or young Cœlebs, as he was called, was meant. This bull was purchased in Boston by Mr. K. J. Robinson, who sent it to his father in Hallowell, by whom it was owned and kept for several years—the first short-horned bull, the General thinks, ever brought into the county. It was afterwards disposed of to Mr. Kezer. General Robinson was always active in the promotion of agriculture and the improvement of stock—cattle, sheep, swine, etc. He owned a quarter of the first Spanish Merino buck brought into Maine. It came into port as part of the stores of a vessel, and was sold by the Captain, who found the sheep fever running high, for $200. It was a great improvement on the native sheep, but its wool was not near as fine as the Merino of to-day."

VII.—Field Horse-Tail, or Pine Weed—(*Equisetum Arvense*).

I should have spoken of this weed in its proper place but for the fact that I desired to wait to the latest possible moment for additional information, which I expected to receive, but which I am now disappointed in not being able to present in this place. The plant itself, I have no doubt, is well known by our farmers. It makes its appearance in April or May, and is generally found in low, damp situations. At first it is only a simple jointed stem of a light brown color, having at each joint a sheath-like appearance

of a darker color. At the top of the stem is a head shaped very much like a pine cone. These produce the spores, by which the plant is propagated, upon their inner surface. As these stems shed their spores they die, and later in the season the lower ones make their appearance, which are green, from eight to twelve inches high, and look very like a pine tree in miniature, hence the common name "Pine Weed." Todd, in his "Young Farmers' Manual,"* says concerning this weed: "The testimony is most conflicting, some saying that it is harmless to all domestic animals except horses; others that it harms only cattle or sheep; and others again, that it furnishes in some places the chief forage. With regard to the poisoning of animals, I am inclined to be a little skeptical, as their instinct generally leads them to avoid injurious plants."

On the interval lands along the Sebasticook river in Winslow this weed is quite common, and I have received the testimony of one of the most careful and observing farmers in that town, in confirmation of its highly injurious effects if fed to horses. Two different horses fed upon hay in which were considerable quantities of this weed were badly affected, and one died, from eating it. Giving some account of the above cases, this farmer says, concerning the one that died: "The next attack was a young mare that I had owned two years, and fed her chiefly on hay in winter. Two years since I mowed a piece of interval that had been tilled a number of years previously, but was then in clover and filled with pine-weed. This I fed to the mare for some time, till I noticed an apparent stiffness in her limbs, a twitching with her head and unsteady standing, particularly in her hinder parts, and shying and staggering when led through a door or gate. I fed her differently, giving her potatoes freely and using timothy instead of clover, in which I presumed there was but little pine-weed. From that attack she recovered. The next winter I again fed her with hay filled with pine-weed, but as she left so much of the weed in the crib, which I took out and fed to the cows, I did not fear another attack, though I feared the pine-weed was injurious or it would not have been left. After being at hay about a month the former symptoms

* The Young Farmer's Manual, by S. Edwards Todd, in two volumes: Vol. I. The Farm and the Workshop, Choice of Tools, &c. Vol. II. How to make Farming Pay, or the General Management of a Farm. Published by F. W. Woodward, 37 Park Row, New York City. A work I would like to see in the hands of every farmer in the State, and one containing a larger amount of really practical and useful matter than any other with which I am acquainted. A new edition has just been issued, 1867.

came on, and continued till it produced abortion, from which she never rallied. Her eyes remained bright and her coat glossy. A number of days before she died, she commenced turning to the right in a circle (occupying twenty feet of the barn floor) till her strength failed her and she fell down. She walked in this circle more than sixty hours without stopping longer than to take a mouthful of hay occasionally. After she fell she lived about two days in great agony. I did not kill her, as I had no thought that it was poison, but having gained more knowledge of the weed, I have no doubt it was from eating it. In the *Maine Farmer* of June 15th, 1865, is a statement that a farmer in Bethel lost a colt from the effects of eating this weed. This farmer had an old horse and a colt standing side by side and fed in the same manner. While the horse discarded the weed and poked it one side by itself, and was therefore unharmed, the colt ate its hay clean, and very soon died from its effects. These well authenticated cases confirm me in the belief that the weed is poisonous to horses. Drains that will remove the subterranean water from the soil, will destroy this weed as it is never found except upon moist, low land. I believe farmers should exercise great caution about feeding hay in which the weed is found, to young horses.

VIII.—Smut in Corn.

"There exists great uncertainty as to the cause of this malady, and I am not aware of any known preventive or remedy." These words I used in chapter IV of the second part of this work, in speaking of smut upon Indian corn. The subject is one I have long been interested in, and have sought diligently for information concerning it in all the works to which I have had access from the writings of Deane, Fessenden and Wm. Cobbett, down to the very unsatisfactory work of Enfield, published in 1866; and from the very meagre and uncertain descriptions of, and information concerning this disease found in those works, I was led to use the language I did. Since then I have procured two works* which give much information upon the matter, and from which I have gathered the following:

---

* Contribution to the Knowledge of the Different kinds of Brand in the Cereals and Blight in Grain. By A. C. Corda. Translated from the German by E. Goodrich Smith. Albany, N. Y., 1847.

Rust, Smut, Mildew and Mould. An Introduction to the Study of Microscopic Fungi. By M. C. Cooke. With nearly 300 colored figures by J. C. Sowerby. London, 1865.

Smut upon Indian corn belongs to the genus *Ustilago*, and is known as *U. maydis*. The spores in this species are exceedingly minute, so much so that fifty are contained within a space the one-hundred-and-sixty-thousandth part of a square inch or nearly eight millions within a square inch of surface. It is in the form of a black powder, every granule of which constitutes a spore or protospore capable of germination, and ultimately, after several intermediate stages, of reproducing a fungus like the parent of which it formed a part. Mr. Cooke says: "During the growth of the plant its virulent contents flow like a poison through the innermost tissues, and at length attack the peduncle or axis of the spiklets of the ear, raising up the essential organs and reducing them to a rudimentary state. * * * * Some ears of corn in nearer proximity to the smutted ears may be covered with the spores which yet remain invisible to the naked eye, and when these ears are mixed with others in the heap, the chances are not much in favor of any not becoming charged with spores. * * * * Experience has taught us that fungi flourish in proportion to the wetness of the season, or dampness of the locality. A wet year is always exceedingly prolific in fungi, and a dry season correspondingly barren."

As to remedies or preventives, it may be safely asserted that no seed should be planted except from ears which have remained wholly free from the brand, (smut). Cooke says upon this point: "The facts that we rely upon chiefly as indicating the remedy are that the spores are only superficially in contact with the seed corn, and that they are of less specific gravity, causing them to float on the surface of any fluid in which the corn may be immersed. Again, the spores of many species of fungi will not germinate after saturation with certain chemical solutions." He recommends for this purpose a strong solution of Glauber's salts in which the seed corn is to be washed, and afterwards, while still moist, dusted over with quick lime. The rationale of this process is thus explained by the author: "It consists in the setting free of caustic soda by the sulphuric acid of the Glauber's salt combining with the lime, and converting it into sulphate of lime. The caustic soda is fatal to the germination of the spores." Corda says: "The brand (smut) bladders can be very easily removed from the living plants by cutting them out, only this must be done as timely as possible in order that in cutting them out the bladders may not scatter their powder, and thus a future crop of brand (smut) not be prevented." If thus cut out, every particle must be burnt or

otherwise destroyed. Enfield, in his recent work, in speaking of this fungus growth, attributes it to the bruises and lacerations inflicted upon the young plant by a reckless mode of cultivation, the bleeding from which results in the formation of the fungi, but this statement is wholly erroneous and is only equal with many others found in his somewhat pretentious, but singularly inaccurate and unsatisfactory book.

IX.—Lumber Trade of Gardiner in 1864.

The following statistics of the lumber trade of Gardiner for 1864, were kindly furnished by Hon. John Berry:

"In reply to your letter of the 3d ult., I have to inform you that after many visits to the lumbermen, and much labor, I have obtained the following statistics of the lumber business in this city for the year 1864, which I think are very nearly correct:

Capital employed in the manufacture of lumber, three hundred and sixty thousand dollars, ($360,000.)

Long lumber manufactured, 14,000,000 feet, value, $330,600; shingles, 17,100,000, value, $69,000; clapboards, 1,300,000, value, $39,000; laths, pickets, bed-rails, broom handles, and curtain sticks 5,150,000, value, $14,000; making the total value of lumber manufactured in 1864, $452,600. Number of mills, up and down saws, twelve; circular board saws, two; clapboard saws, nine; shingle saws, ten; lath saws, seven; box machines for the manufacture of sugar box shooks, seven; for the manufacture of salt boxes, one; planing machines, two. Number of firms engaged in the manufacture of lumber, ten; number of men employed, two hundred and fourteen; number of horses employed in transporting lumber from mills to vessels and cars, thirty-four. Cost of labor, $52,000. Tonnage of vessels employed in transporting lumber to market, two thousand tons; (a large quantity of this lumber is transported by rail.) Long lumber and clapboards planed, about five hundred thousand."

X.—Farm of the Insane Hospital, Augusta.

Connected with the State Institution for the Insane, at Augusta, is a farm of two hundred and thirty-two acres, well managed, and provided with superior out-buildings, which is under the supervision of Jefferson Parsons, Esq., the efficient Steward of the Hospital. I have not given an account of this farm, because it has seemed more to my purpose to show what private farmers have

done in the way of farm improvements and the production of crops with their own resources, than to exhibit what can be done upon a farm having the patronage and fostering support of the State. The live stock upon this farm consists of twenty-six cows, six oxen, three young cattle, five horses, fifty hogs, and one hundred pigs. Considerable attention has been given to breeding, and they have good specimens of full blood Devons and Ayrshires, as well as of Prince Albert, Chester and Suffolk swine. During the year ending Nov. 30, 1867, there was sold from the farm $939.81 worth of produce (besides that enumerated below), and the milk produced for the same period was estimated at $1,210.30. The other products of the farm for the year 1867, for which I am indebted to the books of the Treasurer, are as follows:—Two hundred tons of hay, seven tons of straw, three thousand heads of cabbage, two hundred and forty bushels of barley, seven hundred and seventy-eight bushels of beets, one hundred and seventeen bushels of turnips, one hundred and twenty-five bushels of corn, two hundred bushels of apples, seventy-five bushels of beans, six hundred and forty-eight bushels of potatoes, four thousand pounds of squash, fifteen hundred pounds of pork, and two hundred pigs. The total value of the above products, according to the valuation of a committee of the Trustees appointed to take an inventory of the farm, stock and products, was $9,280.46.

SOUR KROUT.

LINCOLN COUNTY, November, 1867.

S. L. Goodale, Esq., Secretary State Board of Agriculture:

SIR:—In a conversation with you in relation to an important article of food, known as Sour Krout, manufactured from cabbage, I formed the opinion, (which was contrary to my former impressions,) that a knowledge of the manner of its preparation and its value was limited to a small portion of our State and as you requested, I now proceed to give such information on the subject, as I possess. I think Sour Krout is of German origin, and that it is of almost universal use among the people of the various Germanic Provinces, and is also highly esteemed as an article of diet by the people of other European countries. With the Germans it is a sort of national dish, and, with them, is as indispensable to good living, as is the potato to the Irish, good beef to the English, or olives and maccaroni to the Italians.

In this section it is probably more used than elsewhere in Maine, from the fact that it was introduced by the first settlers of the important town of Waldoboro', who, as is well known, were from the German Provinces of Brunswick and Saxony and induced to emigrate thither, through the flattering offers held out by Gen. Waldo, proprietor of the Waldo Patent. These settlers, numbering forty families, came over in 1740. In 1752, there were further arrivals of Germans, equal to twenty-five or thirty families. It was the hard fate of these emigrants after their arrival, to encounter the most severe hardships. They found themselves in a wilderness country, at long distances from other settlements, without dwellings, and destitute of provisions, or the means of obtaining them. As a consequence, many of them perished the first winter, either from cold, starvation, or disease. The descendants of the survivors have made good citizens, and have been distinguished for their honesty, frugality and industry. But I am rather wandering from my subject of Sour Krout, which has always been a favorite article of food with the Germans of Waldoboro'. Every German family there, which makes any pretensions to living well, lays down, at least one barrel of it, as regularly as it does a

barrel of pork. Nor is the practice confined to the German descendants of that populous town, it being quite as much in vogue with the rest of its people. Of course, the citizens of that town are proverbial for having good cabbage yards. If it happens that an unfavorable season cuts off their cabbage crop, they take measures for securing a supply from some other quarter. In the year 1865, owing to a partial failure, some twenty tons of cabbage were obtained from the vicinity of Portland. The good people of Waldoboro', will have their annual supplies of Sour Krout. Its use there, has naturally enough spread into the adjoining towns, where a knowledge of its preparation and merits generally prevails.

The easiest, cheapest and most profitable mode of preserving a crop of cabbages, is to make them into Sour Krout. From forty to fifty good sized heads will make a barrel. The process of manufacture, is simple, and an agricultural neighborhood unacquainted with it, can well afford to procure an experienced hand to initiate it into the mysteries of Krout making. Cut from the heads the outside and loose leaves—quarter the heads and throw them into a tub of clean cold water, from which they are taken, one piece or more, and placed in a small box open at top and bottom, which runs in the grooves of the Krout machine, which is about four feet long, one foot wide, and six inches deep. The box runs over three or four knives, (sometimes made of old scythes), fixed diagonally across the bottom of the machine, the edges of the knives being slightly raised above their level, and the action of moving the box back and forwards in the grooves, pressing down at the same time on the cabbage in the box with a small piece of board, cuts it into thin, small slices, which drop into another tub sitting under the cutter. As the cabbage is cut it is transferred to a clean barrel—a pork barrel is preferable—and pounded down with a heavy wooden mallet, into one end of which a handle of suitable length is inserted. The more closely it is packed in the barrel, the better. With pains-taking, from two hundred and fifty to three hundred pounds of cabbage can be put into a barrel of forty gallons. An old tradition, that the most approved way of packing down Krout was by having it trodden down in the cask by some of the most buxom girls in the neighborhood, has probably a little of romance in it. It is a fact, however, that in the olden time it was sometimes the practice to have it trodden down by a stout man, he first thoroughly washing his feet and putting on clean cotton stockings, but now-a-days the mallet, or Krout *mullet*, as it is often called, has

taken the place of pedal extremities. One pint of fine salt to a barrel is sprinkled with the cabbage as it is packed down. No addition of water is required, as the juices of the cabbage, with the water absorbed by it after being quartered, creates all the moisture necessary. It is usual to fill the barrel to within two inches of its top, cover the Krout with some large cabbage leaves, on which is laid a wooden cover, small enough to be inserted within the barrel, which should be kept firmly in its place by a heavy stone, until the process of fermentation is over. Place the barrel within five or six feet of the kitchen fire. In a few days fermentation will occur, which may be hastened by the addition of a little blood-warm water, a frothy scum will rise and run off and the Krout is "all right" and ready for use, and the barrel may be set in the cellar, which is the usual course, or in the porch or shed. Freezing does no injury. It will keep in the cellar until March or April, without depreciating, and longer in a cooler place. In an air-tight vessel it will keep an indefinite length of time, and is preserved in that way for long voyages. I believe it is one of the common stores in our ships of war. Passenger ships from German ports usually have a supply, unless provided by the passengers themselves. Five hundred passengers on board a Maine ship bound from Bremen to New Orleans, laid in two casks of Krout and two barrels of dried plums. They boiled it with pork and added some of their dried plums. A barrel of it can be made in two hours by two men. Any prejudice existing against Sour Krout, for want of cleanliness, is not well founded, where even ordinary care is exercised in its preparation. There are various modes of cooking it, while some prefer it raw, as it is taken from the barrel, eating it as a salad. It is frequently boiled, for three hours or more, with salt pork added, cut into small pieces. A Pennsylvania German delights to boil with his Krout a year old fat hen or rooster, or rib of beef. Perhaps the nicest style of cooking Krout is to fry it in pork fat, or with the gravy from roast pork. When fried it had better be boiled two hours first, as it is made more tender. As to the best method of cooking it, let every one consult his taste. This is certain, that it is wholesome, hearty food, and as such, is particularly appreciated by laboring men and others requiring a substantial diet, while it is equally relished by many of more fastidious tastes.

That this communication may be the means of increasing the preparation and consumption of Sour Krout in Maine, is the desire of a

FARMER.

THE ATTRACTIONS OF AROOSTOOK COUNTY IN AN AGRICULTURAL POINT OF VIEW.

Ten years ago I made an examination of the newer lands of Northern Maine, popularly reputed to be the garden of the State, but of which there then seemed to be little definite and reliable knowledge generally diffused among our people. The impressions received during that survey were given to the public in my report for 1857.

During the following year an excursion thither was projected and carried out by a considerable editorial corps, chiefly from this, with several also from other States. Their views were widely spread before the people and greatly served to extend a better knowledge of the vast agricultural capabilities of this remarkable tract of country. Calls for information poured in upon the State Land Agent, which led to the publication of a pamphlet which was extensively circulated, designed to afford replies to the inquiries made from all quarters. For several years thereafter immigration into Aroostook county progressed with a steady, rapid and healthy pace, until arrested by the war of the rebellion, during which that county was drained of large numbers of its most able-bodied population.

The check to its agricultural development thus received, is not yet fully recovered from, although more have returned and more of others have gone in than was expected a few years since.

Six years later, viz: in 1863, this section of the State was again visited by me, but there appearing to be no special call to make it the subject of comment at that time, it was not dwelt upon in my report for that year.

A careful review of my field of labor having lately led me to the belief that no better service could be rendered, in my official capacity, than once more to invite attention to the natural advantages, and especially the agricultural capabilities of this section, it was again visited during August and September of the current year,—partly with a view to the correction, if need be, of any erroneous impressions previously held, and also to ascertain, from personal inspection, the progress of agriculture, and whatever changes

might have taken place since the previous visits. I consider myself particularly fortunate in having for a travelling companion an ex-president of the Board of Agriculture, the Hon. S. F. Perley, whose practical familiarity with all which pertains to New England agriculture, as well as his keenness of observation and soundness of judgment need no commendation from me to be fully appreciated by the people of Maine.

It is not proposed, at this time, to go into a very elaborate and detailed report of Aroostook county, but rather present a brief and concise resumé of the principal features observed, and of the conclusions arrived at.

At the outset I may express a hearty willingness to fully endorse whatever was said in my report of 1857 of the natural richness of soil and general agricultural capabilities of this section, and I trust there will be as little of exaggeration in my present remarks as in former ones.

Soil. That portion of Northern Maine to which attention is now directed, lies adjoining New Brunswick on the east, and for a breadth of five or six townships westerly therefrom; beginning on the south near the towns of Hodgdon and Patten and extending north to above the Aroostook river,—embracing an area of about two thousand square miles.

With varying modifications, the soil of this tract might perhaps for the most part, be called a gravelly loam; yet it is quite unlike that of any other portion of New England which I have seen, being chiefly of limestone and slate origin, deep, rich, and for the most part dry enough, by reason pervious ledge or porous subsoil, to allow superfluous water to pass readily downward without artificial aid. In many places very little difference is perceptible in the quality of the soil for several feet in depth. The surface is less hilly than the average of the State, yet possesses sufficient diversity of inclination to afford delightful scenery and avoid anything like tameness of view or prairie-like monotony.

Without expressing any opinion in regard to the geological age of the slate here in place, I may say that *agriculturally* it bears a close resemblance to the so called Utica slate in the ease and rapidity with which it disintegrates by weathering, and the constant and abundant contributions which it thus makes to the wealth of the soil. The country itself exhibits more similarity to those rich grazing sections where the Utica slate prevails, as for instance, Herkimer county, New York, than any other I have ever seen;

and no doubt is entertained that it is of nearly or equal value for grazing purposes. If not fully as valuable, the difference is in the climate and not in the soil.

Growth. The original growth of the higher portions consists largely of sugar maple and yellow birch, interspered with ash, beech and other deciduous trees, the unusual size of which furnishes an obvious and reliable indication of the natural fertility of the soil. Stumps of enormous pines are still to be seen, but the living tree has almost wholly disappeared. On the lower grounds what is called "black growth" prevails almost exclusively, consisting chiefly of cedar (arbor vitæ), white spruce and larch (usually called hacmatac). When cleared, these lands prove productive far beyond what is usual with those covered with similar growth in other sections of the State.

The rapidity with which the better grasses, timothy, brown top, blue joint, clover, &c., take possession of partial clearings, tracts accidentally burnt over, and even the forest itself, is very remarkable and shows a wonderful adaptation to their growth.

Climate. This was formerly the great bugbear impeding settlement, the general impression being that however rich the soil, the season was too short, or the frosts too early, to permit successful agriculture. But either because of a better knowledge of the facts, or of changes attendant upon enlarged clearings, very little complaint is now heard. We are inclined to believe that the climate has undergone considerable modification from what was experienced by the first settlers, and that the season will lengthen still more as the axe and plow continue to gain upon the forest.

Whether such change can go on much farther without drawback in the way of droughts, which usually follow extensive destruction of forests, is a problem yet to be solved by experience. Thus far, however, if any reliance can be placed on uniform testimony, there has been, for many years, a continuity of freedom from injurious droughts wholly unknown, so far as I am aware, in other sections of New England.

What has helped to beget and to spread an impression of too short seasons to ripen the usual crops, more than the actual facts in the case, was the practice,—not yet, I am sorry to say, wholly abandoned,—of engaging in lumbering operations, and the consequent neglect of the farm till log driving is past. We find here, as in similar cases elsewhere, that the farmer who heeds the logs more than the land, comes off second best; and perhaps even worse

in Aroostook than in some other places. Snow falls early and lies continuously on the ground till spring, or I might almost say until summer, for the transition period between winter and summer is very brief, there being no such protracted term as is found farther south, during which spring work may be done or deferred with an approach to impunity, at the farmer's option. There is need, anywhere in Maine, of doing what can be done toward the preparation of the land by plowing and manuring in the autumn* previous; and if this be done it will be found a marvellous help towards the accomplishment of farm spring work.

In Aroostook, generally, when the snow disappears there is no occasion to wait a single day for the frost to come out, or for injurious wetness to abate; that went on all the while under the snow, and the crops can be put in without any delay. Farmers there tell me that they frequently are putting in their wheat while snow yet lies on a portion of the very field operated on. As to the length of the term during which cattle must be fed from winter stores, the closest inquiry we could make failed to show any material difference between there and the southwestern part of the State. Indeed, if fair allowance be made for the excellence of the fall feed and for the fullness of the spring bite as soon as the snow melts, any possible difference might be in favor of Aroostook. Residents who have had experience in Southern Maine and in Massachusetts claim very decided advantage on this point. However this may be, there can be no doubt that, when spring or summer has fairly set in, the rapidity of growth is wholly unparalleled in sections farther south.

Health. On this score no region can be found possessing greater immunity from disease. Let me again quote from the testimony of surgeons resident there in 1844–5, when their reports were made to the office of the Surgeon General of the United States:

"This region is probably one of the healthiest within the limits of the United States. Fevers, and other diseases of malarious origin, are unknown, and other acute diseases are of rare occurrence. The climate though rigorous is uniform for long periods, and does not appear favorable to the development of pulmonary consumption or other affections of the respiratory system. The country is very little settled, but so far as my observation extends, no case of consumption has occurred either in the permanent inhabitants or

*See a valuable paper in the report for 1866, page 99 et seq. on this subject.

among the lumbermen who pass the entire winter in the open air, and are the most hardy and athletic of men."

On my late visit, a physician at Presque Isle assured me that he had not known, during his whole experience there, a single case of serious pulmonary disease to originate within the field of his observation, while it was very common for those who had contracted such disease elsewhere to improve, or wholly recover, on coming there.

The agricultural capabilities of Aroostook differ not more widely from those of other sections than does the system of culture and cropping which there prevails. In the older parts of Maine, as a general rule, we find that the breadth devoted to grain crops bears a small proportion to that yielding grass,—perhaps not above one-tenth on an average,—hay being the great staple crop of the State at large. But in Aroostook there appears to be, pasture lands excepted, nearly or quite as many acres devoted to grain as to grass. This wide contrast naturally suggests inquiry into the causes of the difference; and the chief seem to be the ease with which its friable soil is satisfactorily worked, its freedom from stones, either upon the surface or within reach of the plow, and its capability of production with small help from manure. I may here quote from a note lately received from Mr. Francis Barnes, a young farmer who took up his residence in Houlton a few years since:

"I have had no cause to regret my choice of Aroostook, with its rich, mellow, easily worked soil, for my home. As I travel to and fro through the rest of the State and see the hard, stony land which the people live on, my thoughts recur with pleasure to our smooth, rolling fields, so rich, so smooth and so easily worked. I do not know that anything will better show the difference than the fact that one pair of horses weighing 1100 lbs. each, or a yoke of oxen girthing $6\frac{1}{2}$ to 7 feet, are either alone sufficient to do all our plowing. During a recent visit to Penobscot county, I almost involuntarily asked if they raised any grain at all, the little patches seeming so small and trifling compared with our large fields of oats, wheat and barley. The remark was several times made to me that their land would hardly bear an oat crop without injury and with profit. I have a neighbor who has just harvested thirty-five acres of oats, and I am arranging to have forty acres in oats on my place next year. Too much has not been said and can hardly be said in favor of our county. It is literally the garden of New England. If any doubt it, let them come and see."

Perhaps no single feature of agriculture in Aroostook strikes a stranger with more force than the ease and success with which buckwheat is grown, and the popular estimate of its value as a crop. The species grown is known as "rough buckwheat," and appears, from the best information to be had, to be indigenous to the country, having been found by the Acadian refugees when this section was first visited by the white man.* It is quite distinct from the smooth or beechnut shaped, which latter has frequently been tested here, but was never more esteemed than generally elsewhere; while the rough sort has been steadily growing in estimation and culture ever since first tried by the early settlers. It is grown and harvested at less cost than any other grain. Partially seeding itself, crop after crop is grown in succession, without manure, till even Aroostook soil begins to yield too scanty a return. Forty bushels per acre is considered a fair yield, though fifty or sixty are sometimes obtained, but as may be easily supposed from the style of practice mostly prevailing, crops of twenty or thirty bushels per acre are more frequent than twice as much. The grain weighs from 46 to 50 lbs. per bushel, of which about one-third is hull and quite worthless. It is easily separated, however, by suitable grinding—in which the millers are well skilled—and there remains about thirty pounds of flour and middlings, or bran, in about equal proportions. The estimation in which it is held is much higher than seems warranted to one only familiar with the reputation of buckwheat in most other parts of the country. To some extent it is used on the table, but chiefly for fattening beef, pork and poultry. When making inquiry about Indian corn, the remark most frequently made was, "Yes, we can grow corn well enough, but 'tis no object; we can get three or four bushels of buckwheat easier than one of corn, and it is worth two-thirds as much per bushel."

It appears from the statistics of United States census for 1850 that Aroostook county, containing about one-fiftieth of the population of the State, produced the year previous eighty-six thousand five hundred twenty-nine bushels, while all the rest of the State produced only eighteen thousand bushels. It has since become

* Dr. Holmes in his report on this county, made in 1838, says: "I was credibly informed that Mr. Murphy, the first settler in the Tobique settlement, stated that when he first went there, and while there was no clearing for many miles, he killed partridges that had this grain in their crops, and that he took it out and sowed it, thereby obtaining seed for future use."

more popular in other counties also, especially Piscataquis and Northern Penobscot, and the returns for 1860 show a produce of two hundred and thirty thousand bushels in Aroostook, with one hundred and nine thousand bushels in the rest of the State.

Next to buckwheat, oats are most largely grown, being highly productive, possessing a plump kernel and giving profitable results. The culture of wheat was discouraged for awhile by the ravages of the midge, but latterly it is reported to be considerably on the increase. The United States census statistics of 1850 give the number of bushels of oats and rye grown in Aroostook as 144,507 and in 1860 of oats alone, at 419,783,—an amount exceeded only by one other county (Penobscot, 463,080,) in the State. Of wheat in 1860 the number of bushels reported is 24,763, or about three times as much in proportion to population as the average of the State. Barley and rye are grown, but not extensively, the census returns for 1860 giving 16,471 bushels of the former and 26,714 of the latter. By the same authority we learn that there was nearly twice as much Indian corn grown in Aroostook as in Washington ; these two counties being by far the smallest producers of this grain of any in the State.

I do not know how near the exact truth may be the results given by the census statistics, but assuming that they may be such an approximation as will assist in forming correct views, it may not be out of place here to introduce some other items from the returns of 1860 : Butter, 467,301 lbs.; potatoes, 411,630 bushels ; somewhat above one-twenty-fifth of the hay in the State ; more than one-sixteenth of the value of the slaughtered animals—more than one-eleventh of the home-made manufactures ; more than two-fifths of the maple sugar, or 129,875 lbs. against 306,742 lbs. in the whole State. The returns of 1850 give the number of farms in Aroostook county as 1,228, containing 55,000 acres improved and 140,000 of unimproved land. In 1860 the number of acres of improved lands in Aroostook is stated to be 124,117, which is more than in either Hancock, Knox, Lincoln, Piscataquis, Sagadahoc or Washington counties ; and the unimproved acres in farms are stated to be 336 669.

Fruit Culture. In no one feature has the improvement been more marked than in the attention given to fruit culture. Ten years ago the number of orchards was very small, and an impression seemed to prevail generally that the successful growth of even the apple was out of the question. Now, apple orchards are quite

common, and their health and thrift will compare favorably with the majority of those in the older parts of the State. Still a great deal remains to be done, for in many cases the trees are not yet grafted, and their number should be greatly multiplied. The requisites to abundant success are few, but such as they are, they *must* be complied with. First, let a sufficient number of seedlings be raised in nurseries to allow the orchardist, after several years, to select only such as have proved *hardy enough*, and at the same time healthy and vigorous. The next is, to have these grafted with such sorts *only* as are found by experience to succeed well in that soil and climate. The number of these is as yet very small compared with those which succeed elsewhere, but there are those which do succeed well enough, and even better there than farther south and west, in a soil and climate less congenial to them. Let it be remembered that the reputation of different varieties for the various qualities in which they severally excel in other sections, and particularly as to hardiness, is no reliable guide by which to judge of their adaptation to the soil and climate of Aroostook.

I never saw, anywhere, a more productive, vigorous and profitable orchard of its size and age than I saw last September in the town of Woodstock, New Brunswick, about 12 miles from Houlton, on the grounds of Mr. Fisher, a lawyer of that place. It covered several acres. The trees were grown near by and planted by Mr. Sharp, a nurseryman long resident in the town. They were all grafted, and with only such sorts as he had ascertained by many years of experience to be well adapted to the location. Meantime he had found occasion to reject scores of varieties popular and useful elsewhere, for every one which succeeded satisfactorily after a sufficient term of probation. Such a culling and sifting is of incalculable value, and ought to be appreciated. It costs money, and labor, and years, and disappointments, and those who will, may profit by it to as large extent as if each one should incur all the cost attendant upon it for himself and his own private benefit. By far the greater number of trees in this orchard were of what I supposed to be the variety known as Duchess of Oldenburg (a well known apple of Russian origin) but which he assured me was a seedling of his own raising from that variety, and in appearance of both wood and fruit was an almost exact reproduction of the same, but endowed with marvellous productiveness, insomuch that it bore annually such burdens of fruit that the limbs required to be propped up every year with artificial supports, or much peril was incurred

of the branches splitting off from the tree. The fruit was large, exceedingly fair and handsome, and good enough to be very popular and profitable. The third requisite which I will name to successful orcharding in Aroostook is *shelter;* and this is useful enough anywhere in Maine to demand vastly more attention than is given to it. Let the position of both the nursery and the orchard be such that it be protected from the full sweep of blasting winds. It matters not whether it come from the "lay of the land" or from a natural forest growth, or from belts of evergreens planted for the purpose; but *somehow or other* it should be secured. Were it not that nature has provided sufficient drainage by a pervious sub-soil over so large a proportion of the surface, I should add under-draining, but so far as I could judge, there is, generally, no occasion for incurring any expense on this score.

Markets. The agricultural productions of this region, for the most part, find a ready market close at hand; and the lumbering operations would readily absorb a much larger amount of some, particularly of pork, than is produced. I have been greatly puzzled to find, or imagine, any adequate reason why more of this is not grown, especially with the facilities possessed for growing roots and buckwheat. These will make good pork, provided always, that any pork is good for food. There are plenty of people who will buy pork and eat pork, if not of the Aroostook farmers, of somebody farther off. I did not learn of the prevalence of Jewish prejudices against swine, nor that they were restrained by fear of peril from *trichinæ*. The swine which I saw there manifested a general improvement in breed over what prevailed ten years ago, and there were some who availed themselves fully of the facilities at hand for raising them. It is alleged by those who have the means of knowing the facts, that not less than three thousand barrels of pork are annually imported into the county for the use of lumbermen.

To a moderate extent, horses, cattle, and grass-seed have been exported, and with the railroad facilities now enjoyed, and which can hardly be improved for the vicinity of Houlton, it is likely that the amount will be increased, and numerous other articles be added to the list of exports. An extensive and lucrative business might easily be established in the manufacture of starch, for use in the cotton mills of New England. The demand is large, and nowhere are good, *mealy* potatoes more easily grown than in Aroostook.

Within a year or two a hay press has been put in operation in Houlton and compressed hay sent to Boston.

No region can produce butter and cheese cheaper than this, and the charge for transportation bears small proportion to their market value.

The style of farming which chiefly prevails, as might be naturally expected to exist under the prevailing conditions, is such as is calculated to reap as large returns as consists with moderate expenditure for labor. To a certain extent this is undoubtedly justifiable, but there needs to be care that it be not carried to the extent of wasting manure, or such skinning of land as has been the bane of many sections which possessed less native wealth of soil, and which will be as surely baneful here as it has ever proved elsewhere, even if not so rapidly exhausting.

The scarcity and dearness of labor has operated here as in other sections toward the extensive introduction of labor-saving implements. The past ten years has witnessed a great increase in the number of mowing machines, horse rakes, horse forks, &c., &c., in use throughout the region.

In some parts of the county the same period has also witnessed an introduction or rapid spread of weeds, and especially of the Canada thistle; and this to an extent which not only greatly mars the agricultural beauty of the country, but must seriously diminish the amount of the crops, and deteriorate the value of grass seed for export, as well as entail upon future cultivators, ambitious to redeem the land from such exhausting curses, protracted and laborious efforts for their eradication. I do not, however, look upon this as the unmitigated fault of the people, but rather see in it (in part,) as in armless sleeves and wooden legs and the taxes unknown a few years ago, a part of the cost incurred in conquering the Great Rebellion. However this may be, the evil is a serious one, and the sooner it is earnestly grappled with, and subdued, the better.

If my apprehension of the capabilities of Aroostook be correct, it is easy to predict its future. It must be preëminently a grazing country. Its exports will be horses and cattle, butter and cheese, beef and mutton and wool, *and because of this* its green turf should be filled with nutritive grasses, and thistles and other weeds excluded.

Wants. Incidentally some of these have been mentioned, and possibly quite enough said about them, as of orchards. Care in

the preservation of manure is greater and more general than formerly, but there is room for a good deal more improvement in this regard, *and there is need of it also.*

There is beginning to be need, in some places, of planting belts of trees for shelter. This may sound strangely of so new a country, but it is nevertheless true, and there is great need of caution against the indiscriminate slaughter of native forest growth. In a new country the necessity which exists for levelling and burning is so immediate and imperative, that a feeling gradually obtains, that the greater the breadth of land which is thus served, the greater the progress towards a productive agriculture. But a falser thought has not been propagated by the father of lies. It is true that the evils which ensue are not usually so readily referred to their true cause as in many other cases, but they are not, therefore, any the less real or serious. If a settler gets a burn on his land so severe as to destroy the organic matter contained in the soil, he at once refers the injurious results which follow to the intensity of the heat. Caution is the more needed, because, when at length, the proximate cause of the evils which flow from too great destruction of forest growth is recognized, it requires the lifetime of a generation, more or less, to repair the damage. So much has been said on the subject in former reports, and especially in the one for 1865, that I trust it may not be needful here to do more than allude to the danger.

At the time of my visit in 1857 the burden of desire everywhere seemed to be for better means of communication with the outside world. A feeling of isolation was everywhere manifest. There was talk of "coming in" and "going out" in a style which implied length of time, amount of cost and weariness almost like our fathers felt, years ago, in speaking of the then far off "Genessee country," when that was the Ultima Thule of western civilization. This is all changed now, and the change has come about with so little effort on their part, that not all yet seem fully aware of its magnitude. There is now steam conveyance from Boston or Portland several times a week to within six miles of Houlton, the shire town and centre of business of the county, and this gap will be bridged by the iron rail within a few months. The steamers between Boston, Portland and St. John, touch at Eastport. Here a smaller boat connects to St. Andrews and St. Stephen. From each of these places the Canada and New Brunswick Railroad runs direct to

Richmond as above stated; and branches are being constructed and nearly finished, one easterly to Woodstock, and one westerly to Houlton. Passengers by this route leave Boston in the morning, Portland at 5 o'clock P. M., reaching Eastport the next forenoon, and if the connection is without delay, may arrive at Houlton in the evening of the same day. This railroad runs nearly all its length very near the boundary line, and for all practical purposes —so long as peace exists between the "Dominion" and the States, and bating the inconveniences of Custom House regulations in regard to the transit of goods—serves the purposes of the people of Aroostook about as well as if it had been built and paid for by themselves, and lay within the boundaries of Maine. How serious a matter it may be to the business men of Bangor or other places within the State, that the mercantile wants of that section shall be supplied without their coöperation, is not a point which here demands discussion. Their interests, however, it may be remarked, will undoubtedly be greatly subserved by the railroad now in progress from Bangor northwardly and easterly to the boundary line of New Brunswick, there to connect with an extension leading to St. John. It is confidently expected that this will be completed to Winn, fifty miles, in the course of the coming summer. This road will add very materially to the facilities for conveyance and transportation of the more westerly part of the large tract treated of in this paper; and it is greatly to be hoped, that at no distant day, a branch may be constructed leading directly into the heart of Aroostook, thus furnishing all needful facilities within our own borders.

An impression prevails extensively that the State has bestowed all its public domain in aid of the European and North American Railway, from Bangor to the boundary line. If my information be correct a vote was passed so bestowing them, but upon conditions which have not yet been complied with. In reply to a note addressed to the Land Agent, I have a response from which the following is quoted: "I would say that the public lands have not passed to any railroad corporation, and the State still continues to dispose of her lands in the usual way for settlement. I consider the lands in township 1; range 2; 14 range 3; 14 range 4, as some of the more desirable and offering the largest range for founding a good strong community. From Caribou across to Fort Kent road the soil, I am told, will open beautifully for tillage, and some day

will be sought for for agricultural purposes, while now most of the distance is unbroken forest.

Very respectfully yours,

I. R. CLARK."

The "usual way" above referred to is to allow a lot, not exceeding two hundred acres, to be taken by one person, at fifty cents per acre, payable in one, two and three years in labor on the roads of the township under direction of the land agent; the settler being also required, within two years from his purchase, to establish his residence thereon, and within four years to clear not less than fifteen acres, ten of which shall be put into grass, and to build a comfortable house. The terms, therefore, it will be seen, are about equivalent to a gift to the actual settler, nothing more being required of him than to do what is needful for his own convenience and to enhance the value of his land.

The principal want of Aroostook is POPULATION—men and women, bone and muscle and brain, to develop the resources of her soil. There are a great many now, and the number will doubtless increase for some years to come who would go, and do this, if they fairly apprehended all the facts in the case. Let us, therefore, do what we can to cause the facts to be known.

THE CURRANT WORM—ITS HABITS AND MEANS OF PREVENTION.

In some sections this has become quite troublesome, greatly detracting from the usefulness of this otherwise easily grown and very valuable (in its better varieties) fruit.

During my late trip through Aroostook I had the pleasure of meeting J. B. Hayes, Esq., of Lyndon (Caribou) and learned that he had given much attention to its habits and means of extirpation. At my suggestion he has furnished the following:

CARIBOU, Aroostook Co., Me., September 23, 1867.

DEAR SIR:—In compliance with your request, I have the honor to transmit to you a transcript of my memoranda in relation to the currant worm, so called, (*Salandria Ribis*, order *Hymenoptera*, family *Tenthredindæ*,) showing its metamorphoses, from the laying of the eggs by the perfect insect to laying of the eggs by the perfect insect hatched from the first named eggs. In the case observed, "eggs began to hatch July 18, 1867, and continued hatching and eating *on a single leaf* about eight days; at the end of twelve days the whole brood (56 hatched from 57 eggs deposited on the leaf), remained on one shoot and on two or three leaves above that on which the eggs was laid. Within three days from this time, they had attained nearly full growth—three-fourths of an inch—and dispersed themselves over twelve shoots and nearly stripped them of leaves.

Picked the leaves and worms August 2, and placed them in a box with four inches depth of earth (object to ascertain at what depth they changed from larvæ to pupæ); box covered closely with pane of glass so as to observe their progress in transforming. Put into the box fifty-six larvæ; found thirty-four pupæ within one inch of the surface—four deeper; the rest lost; put a number of green leaves into the box at the time I put the worms in for them to feed upon; think they ate till August 4 or 5, and then changed. Aug. 7, box examined and all changed, lost or escaped.

Have this day, Aug. 7, put thirty-six pupæ into glass bottles (vials) for further observation; twelve in each; covered those in

one with one inch dry earth, in another with an inch of moist earth; the third vial had no earth; object to ascertain how long before they would change to the perfect state; corked vials so as to prevent escape of perfect insect but admit air. Think thousands might be destroyed by removing the earth from around the bushes to the depth of two inches,—query, how far round? Pupæ must be destroyed somehow if earth is removed. But I have little confidence in this method of meeting the evil, because thousands will escape you around your own bushes, or if not, around your neighbors, and the perfect insect is exceedingly swift winged, and will not only fly from bush to bush and from garden to garden, but like the wheat midge or potato beetle and others, spread itself miles around.

August 19, several pupæ in each vial had changed to perfect insects, and leaves of red, black, and Victoria currant were put into the vials, and within three days large numbers of eggs were seen on the red currant and Houghton seedling gooseberry leaves in the vials.

Great Remedy—*Hand picking and twelve days to do it in.* The eggs are small, yellowish white and laid mostly in Aroostook (Lyndon) about from 3d to 8th of June, on the under surface of the leaf on the ribs, veins and veinlets,—never on the petiole. As soon as the egg hatches it commences eating, perforates the parenchyma or soft pulp of the leaf, and whenever these perforations are seen the leaf should be picked and destroyed. I have found of young and eggs 227 on a single leaf, by picking and destroying which I destroyed worms that would have destroyed my fruit and bush. Any person will soon learn to see the perforations (holes), and to pick the infested leaves, even a child.

Second Remedy. One pint strong soft soap to two-thirds of a pail of water, well mixed and applied with whitewash brush with upward movement so as thoroughly to wet the under side of all the leaves; it kills eggs and worms; but as there are several broods in a year there will have to be several washings. Whale oil soap-suds is better. Full grown worm three-fourths to an inch in length, covered with small black dots. Perfect insect as long as house-fly,—one-half as large,—abdomen orange yellow, often seen hovering around currant and gooseberry bushes.

Please accept this imperfect sketch and the respects of

Your ob't servant,

John B. Hayes.

THE "SALEM" GRAPE.

[See Frontispiece.]

Many of our cultivators are already acquainted with the eminent success which has attended the efforts of Mr. E. S. Rogers, of Salem, in hybridizing the grape, and by this means securing varieties which combine much of the excellencies of the foreign species with the vigor and hardihood of our wild grape of the woods.

Those hitherto introduced to general culture by Mr. Rogers were under numbers, and not with names attached to each, and have now been tested for a length of time sufficient to establish a character for excellence. The one of which a representation is given in our frontispiece, he has named the "Salem," and has given it to the public for the first time during the present year.

Mr. Rogers, whose reputation for probity and modesty of statement induces entire confidence in what he says, under date of February, 1867, writes as follows: "The Salem is considered not only superior to any of my former well known numbers, but also to any hardy grape at present before the public, combining as nearly as possible every quality desired in an outdoor grape, being one of the hardiest, healthiest, and most vigorous of vines, and producing abundant crops of beautiful and high-flavored fruit.

Like other well known kinds, Nos. 4 and 15, this is a hybrid between a native and the Black Hamburg; bunch large and compact, berry size of Hamburg, of a light chestnut or Catawba color, thin skinned, perfectly free from hard pulp, very sweet and sprightly, with an exquisite aromatic flavor, not equalled by any other outdoor grape for wine or table, as early as Delaware or Hartford, having never failed to ripen its fruit in the most unfavorable seasons, for the past six years. Taking all its qualities into consideration, I can with confidence recommend it as the best of all my collection, and now offer it for the first time to the public."

I am also informed that Mr. Rogers disposed of his stock to James A. Requa, of Amenia, Dutchess Co., N. Y., who grows it extensively in his vineyard, and that vines can also be obtained from prominent nurserymen in any part of the country.

Circumstances prevent the fulfilment, at the present time, of an intention to give some further results of experience in the culture of the grape in Maine; but the present opportunity is embraced to state one remarkable fact, which has come to our knowledge, going to show the importance of *testing thoroughly, in each locality*, such as give promise of excellence connected with sufficient earliness.

In the paper on grapes and grape culture in the report for 1864, it was remarked of the "Early Hudson," that it was "a very good grape, and one of the earliest, but we have discontinued its cultivation because of its *failure to set its fruit* well." Before we gave it up, a vine was sent to a well known member of the Board, residing in a part of the State northeast from where we had tested it, nearly a hundred and fifty miles—Mr. Chamberlain of Foxcroft —and where only the very earliest would succeed. During the past season—the most unfortunate one for grapes in this State which has occurred for twenty years and upwards—his vine, of this sort, bore and fully ripened a crop, the *bunches weighing from eight to twelve ounces*, and we understand that it has not in any year shown imperfection in the matter of setting its fruit, the fault for which in York County we discarded it. The fact teaches a lesson which should be remembered.

In retrospect of the season, it may be said that very unusual rain fall in some months, and continuous moisture in others, has been a prominently marked feature. Grass grew abundantly, but hay suffered in the harvesting—so did grain somewhat. Potatoes ran well for a while, but the rust, or some other sequence in the train of excessive humidity, nipped them before maturity—so with other crops, mingled prosperity and adversity. Yet, on the whole, the agricultural products of Maine attained an amount and value to be thankful for to the Divine Providence.

In looking forward, I deem it a matter for hearty congratulation that the public policy now tends so strongly in favor of developing the latent resources of the State—in favor of inviting capital from abroad, instead of coldly repelling it in accordance with the very mistaken views which obtained at one period. Better mend late than not at all. When our latent resources are uncovered—when our raw materials are wrought at home—when our waterfalls are all harnessed to varied industries, then will be created a home demand for the products of the farm which will accomplish more for the substantial promotion of agriculture, more to induce our sons to till the old home farm and to reclaim other lands near by, instead of moving away to the great West or into large cities, than could be accomplished by the wisest enactments of legislation, if made in direct aid of that Art whereby all other arts live.

S. L. GOODALE,
Secretary of the Board of Agriculture.

JANUARY 15, 1868.

INDEX.