Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

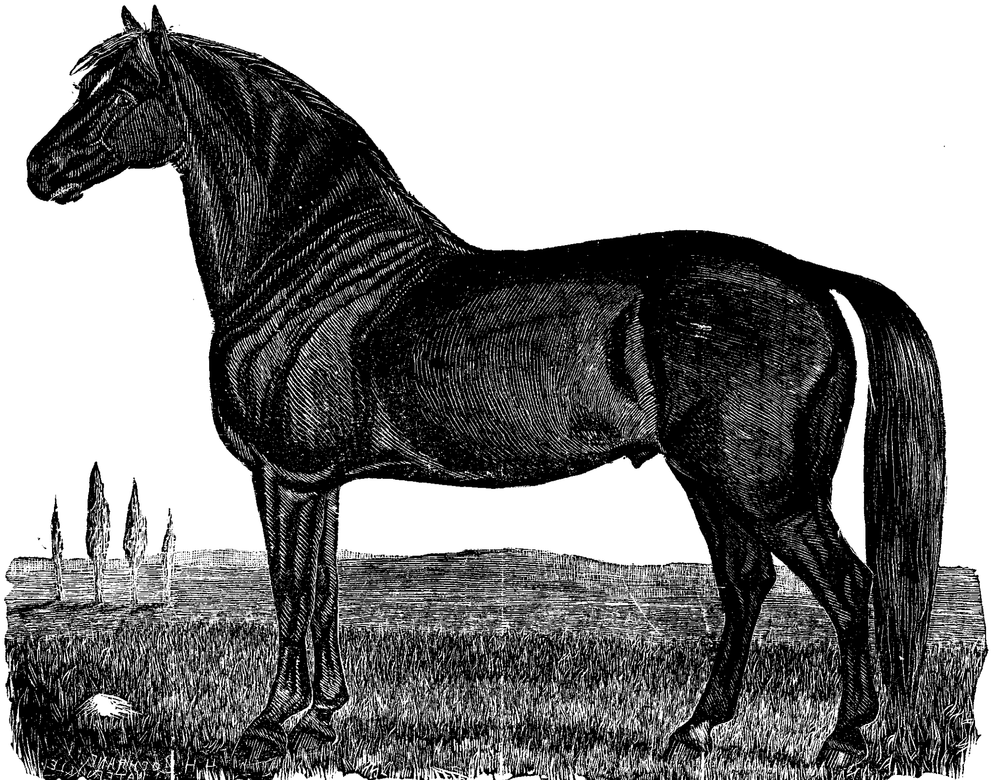
Public Officers and Institutions

FOR THE YEAR

1886

VOLUME II.

AUGUSTA:
SPRAGUE & SON, PRINTERS TO THE STATE.
1886.



Imported Percheron-Norman Stallion, "Captain Pulley." (2985.)

Property of Messrs. BLAISDELL & FOLSOM, Waterville.

AGRICULTURE OF MAINE.

TWENTY-NINTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

MAINE BOARD OF AGRICULTURE,

FOR THE YEAR

1885

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA:
SPRAGUE & SON, PRINTERS TO THE STATE.
1886.

To the Honorable the Governor and Council of Maine:

In accordance with the law of the State, I have the honor to present the report of the doings of the Maine Board of Agriculture for 1885.

Z. A. GILBERT, *Secretary.*

AUGUSTA, January 20, 1886.

MAINE BOARD OF AGRICULTURE—1885.

OFFICERS.

EDWARD WIGGIN, President.
NELSON HAM, Vice President.
Z. A. GILBERT, Secretary.

Members Chosen by County Societies.

			Term expires Dec. 31,
Aroostook County,	Edward Wiggin,	Maysville Center,	1885
Franklin "	J. W. Butterfield,	Phillips,	1885
Penobscot "	J. E. Bennoch,	Orono,	1885
Piscataquis "	O. T. Goodridge,	Milo,	1885
Knox "	M. R. Mathews,	Warren,	1885
Lincoln "	J. J. A. Hoffses,	Jefferson,	1886
Androscoggin "	Nelson Ham,	Lewiston,	1886
Kennebec "	John E. Brainerd,	East Winthrop,	1886
Waldo "	D. B. Johnson,	Freedom,	1886
Washington "	A. R. Lincoln,	Dennysville,	1886
Cumberland "	W. W. Harris,	Cumberland Centre,	1887
Sagadahoc "	S. L. Holbrook,	Brunswick,	1887
Oxford "	A. O. Pike,	Fryeburg,	1887
Somerset "	Geo. F. Moore,	North Anson,	1887
York "	J. M. Deering,	Saco,	1887
Hancock "	Vacancy.		

Members from State College.

President, M. C. Fernald, Orono.
Professor of Agriculture, Walter Balentine, Orono.

Elected by the Board.

Z. A. Gilbert, North Greene, Secretary.

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OFFICERS.

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B. A. BURR, Vice President.

Z. A. GILBERT, Secretary.

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Washington	"	A. R. Lincoln,	Dennysville,	1886
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Sagadahoc	"	S. L. Holbrook,	Brunswick,	1887
Oxford	"	A. O. Pike,	Fryeburg,	1887
Somerset	"	Geo. F. Moore,	North Anson	1887
York	"	J. M. Deering,	Saco,	1887
Aroostook	"	Francis Barnes,	Houlton,	1888
Piscataquis	"	Thomas Daggett,	Foxcroft,	1888
Penobscot	"	B. A. Burr,	Bangor,	1888
Franklin	"	E. J. Gilkey,	Strong,	1888
Knox	"	A. J. Tolman,	Rockland,	1888
Hancock	"	Vacancy.		

Members from State College.

President, M. C. Fernald, Orono.
Professor of Agriculture, Walter Balentine, Orono.

Elected by the Board.

Z. A. Gilbert, North Greene, Secretary.

REPORT.

The annual meeting of the Maine Board of Agriculture was held at the office of the Secretary, at the State House, January 21 and 22, 1885.

The meeting was called to order by the Secretary, and the member from Androscoggin, Nelson Ham, was made temporary chairman.

A committee on credentials was appointed, consisting of

Lincoln of Washington,
Mathews of Knox,
Butterfield of Franklin,

who subsequently reported the following new members duly elected, and they were accordingly declared entitled to seats on the Board for three years:

Cumberland County,	W. W. Harris,	Cumberland Centre,
Lincoln "	J. J. A. Hoffses,	Jefferson,
Somerset "	Geo. F. Moore,	North Anson,
Sagadahoc "	S. L. Holbrook,	Brunswick,
Oxford "	A. O. Pike,	Fryeburg,
York "	J. M. Deering,	Saco.

On motion of member from Washington, proceeded to the election of officers, and the following were declared duly elected:

Edward Wiggin, President,
Nelson Ham, Vice President.

On motion, a committee on pay roll was appointed, consisting of

Walter Balentine,
J. E. Brainerd,
J. M. Deering, } *Com. on Pay Roll.*

The member from Washington moved the appointment of an advisory committee, and the following were appointed:

Edward Wiggin,
M. C. Fernald, } *Advisory Committee.*

AFTERNOON.

Board met at 2 o'clock and the member from Sagadahoc read a paper on "The Work of Agricultural Societies—Its scope and charter," following which there was a full discussion of the subject by the different members.

On motion, the disposition of the State bounty to agricultural societies came up for consideration, and, after discussion, the matter was referred to a committee, who subsequently reported as follows, and the report was accepted and adopted:

Ordered, That the several agricultural societies receiving aid from the State are hereby directed to expend that portion of the State stipend under the control of the Board of Agriculture in special premiums, as follows:

1. For the best system of farm improvements and general farm management; or,

2. For the best kept farm accounts; or,

3. For best experiment in feeding and growing steers, for one, two or three years.

CONDITIONS.

In any of the foregoing classes a first and second premium may be offered, and may be continued for one. two or three years.

Classes 1 and 2 shall be open to general competition.

Class 3 shall be open to boys between fourteen and twenty years of age.

In class 2 the awards shall be based upon that system of farm accounts which most simply and accurately represents the business of the farm for the year, and in this class the books of account shall constitute the requisite report to the society.

In class 3 the experiment shall be reported and the awards made annually.

In all cases complete and specific reports shall be made by competitors to their society, and the same, together with report of awards, shall be forwarded to the Secretary of the Board of Agriculture, the receipt of which, in satisfactory form, shall be evidence that the specified conditions have been fulfilled, and shall entitle the society so reporting to its full apportionment of the State bounty.

THURSDAY.

The business of the morning was the reading of a paper by the Secretary, on the subject, "Does the dairy business of our State, thus far developed, warrant the encouragement by the Board of a further expansion?"

After the reading of the paper, the subject was further discussed, and it was finally

Voted, That in view of the favorable conditions existing in Maine for a promising enlargement of the dairy interest, as furnished by increasing herds of improved stock, by productive grass fields and extensive pasturage, together with easy access to large and remunerative markets for high grade dairy products, it is the judgment of this Board that the dairy industry in our State can be largely extended with safety and profit to Maine farmers.

The member from Androscoggin presented the following resolutions, which were given a passage:

Resolved, That we call the attention of the great agricultural interests of the country to the necessity of co-operation and association in agricultural societies, farmers' clubs and granges.

Resolved, That as the grange is the only agricultural association that combines the influence derived from national, State and local membership under one discipline and interest, we therefore recommend every one interested in agriculture to give the grange a thorough investigation, and such encouragement as the result may warrant.

REVIEW OF THE YEAR.

The agricultural work of the year has been marked by no extremes in any respect. A general rule of a lower grade of prices for all agricultural productions has prevailed, and has been the means of shrinking the income from the farms below what has been realized in years past; and while farmers have felt compelled to curtail their expenses in like ratio, yet there has been no serious embarrassment in consequence, and no widespread complaint of "hard times." It is being admitted by all, that the business of the farm, like every other business, must be adjusted to a lower scale of values than have been ruling in the last decade.

That feeling of confidence in the business of farming, noted a year ago, as gaining ground among us, is still on the increase, and is prompting to efforts called for by the progress going on around us, and which must lead to substantial results.

The crops of the year did not vary widely from the year previous, and, on the whole, may be recorded as about the average of a series of years.

Grass still maintains its supremacy among us as the leading crop produced, and the indications are that its appreciation as an economic crop is on the increase among our farmers. The yield was about ten per cent. larger than for 1884, making the aggregate crop 1,142,396 tons. The weather in the harvesting season was quite favorable, so that the crop was housed in first-class condition. Pasturage was not abundant the first part of the summer, but, as the season advanced, it greatly improved, and held out well the latter part of the pasturing season, affording, on the whole, the usual abundance of pasturage.

The season was decidedly unfavorable for corn—the most so in many years. The early part of the summer was not favorable to the development of the crop, and, as a consequence, it was backward. The month of August proved cold and unfavorable, and the crop on the whole was late and not well grown. The exceptions to this were on warm lands under good treatment, where the usual good crop was made. The increasing appreciation of this crop, as noted heretofore, is still apparent, and the area devoted to it is surely though slowly extending. The limit to this extension seems to be the supply of manures at hand which may be devoted to it. When our farmers shall have mastered the problem of profitable crop production with commercial manures alone, the corn crop will be still further extended among us.

The breadth of sweet corn for canning was about three-fourths of that of 1883, when it assumed its greatest importance among us, but the yield per acre was only two-thirds the average. The quantity put up did not vary largely from that of the year before, or about 5,000,000 cans.

The yield of potatoes was about an average for a series of years, and the crop was in sound condition and of good quality. About two and a half million bushels were used in the manufacture of starch in Aroostook County.

The grain crop of the State was less than last year but was up to a full average. The low price of wheat and flour tended to reduce the area in wheat especially. The yield per acre of this crop was a full average. The breadth of oats sown was somewhat larger than a year ago, while that in barley was considerably widened. This crop is becoming appreciated in Aroostook County, where it is found to yield well. The total of oats for the State is estimated at 3,200,000 bushels; wheat, 500,000; barley, 400,000.

The apple crop was again an abundant one. In some sections it was reported that more market apples were raised than ever before in a single year. It is unusual to have two so good crops in succession. A year ago there were more marketable apples grown in the State than in any single year previous, and it is safe to estimate that the crop of 1885 was fully as large. The wholesale price at shipping stations has run from $1.25 to $1.75 per barrel, averaging about twenty-five cents a barrel less than the price of a year ago.

The live stock interests have not essentially changed from a year ago, save that in all kinds of cattle there has been a shrinkage of value all around of full ten per cent. This lower price of beef has reduced, in a measure, the number of fat cattle.

Sheep have been reduced in numbers during the year about ten per cent. Wool at shearing sold for eighteen cents a pound for unwashed, but advanced later in the season full five cents a pound.

The price of horses has been fully sustained throughout the year, with a demand entirely beyond the supply. An interest is being awakened in the breeding of a class of heavier horses for team and farm work.

Pork products have ruled low. Six cents a pound has been the ruling price paid for round hog, though for a time it was a half cent lower. This is below cost, and, as a result, the stock of this kind is being reduced.

The dairy interests of the State are in a prosperous condition. The prices of butter and cheese have ruled ten per cent. lower than a year ago, but this business is still looked upon as one of the most profitable branches of stock husbandry among us. A new cheese factory was started at Blaine, in Aroostook County, with good prospects of success.

The creameries are becoming well established in the favor of their patrons, and have done a thrifty business through the year. There has been no increase in their number. The butter is making for itself a reputation for good quality wherever introduced. So far, this system of butter making is proving well adapted to conditions prevailing in this State.

The transactions of the agricultural societies show them to have been successful in their annual exhibitions. Those societies which are not confined to a limited territory, without exception, show large receipts at their fairs and disburse liberally for premiums. The management of these fairs is a matter calling for deliberate attention.

The Eastern Maine Fair Association held a joint exhibition with the New England Agricultural Society, at Bangor. The exhibition was made up largely from our own State in all departments.

The joint exhibition of the State Agricultural Society and the State Pomological Society, at Lewiston, as usual drew together an extensive exhibit.

FARMERS' INSTITUTES.

In carrying on the Institute work required of the Board, there are a large number of papers and lectures called for, and on a wide range of topics. On the Board of Agriculture, there are members who are recognized as specialists in the principal branches of farming pursued in the State. These members have been called upon to read papers, give lectures or lead in discussions on their several specialties wherever wanted. In addition to them, others, not connected with the Board, have been invited to aid in the work. Only in one case during the year has the Board received assistance of this kind from outside the State.

Two Institutes were held in Aroostook County, and in each of the other several counties of the State one only was held. In accordance with the law, a record of the work is here given, with such of the lectures, papers and discussions as the limits of this report will allow. The record covers all the Institutes held during the winter of 1885–6. In some cases there has been a deviation from the former practice of filling most of the time with the reading of prepared papers, and instead discussions of the subject by several individuals have been arranged. With proper preparation on the part of those who lead the discussion, this plan has given good results. While this kind of work may not appear so valuable on the records, yet it is believed that as a method of enforcing a fact or giving instruction it is better than more formal work.

AROOSTOOK COUNTY.

Institute at Sherman.

The Institute for Southern Aroostook was held at the Town Hall, Sherman Mills, October 20. The subjects selected were Stock Husbandry, Dairying, and Fruits for the North.

The attendance was large and the interest earnest. A choir of singers interspersed the exercises with good music. Choice samples of many of the leading varieties of apples grown in the vicinity, and specimens of vegetables and grain ornamented the platform. President Wiggin opened the meeting with remarks explanatory of the aims and purposes of the Board, following which was given an

ADDRESS OF WELCOME,

By J. W. AMBROSE.

Mr. President:—In behalf of our people who have assembled here to greet you and your associates, I rise to bid you welcome to the town of Sherman. And in doing so we do not forget that words of welcome are cheaply framed and as cheaply uttered, yet we trust that a few such simple words of welcome as "bubble up from the heart to the tongue," will be acceptable to our visitors, and be taken to mean just what they express. And in this connection we desire to express our gratitude to you, inasmuch as you have at our solicitation come long distances, and doubtless at much personal inconvenience, to meet with us in this section of Aroostook County where we have, as you may say, just begun to live. The spot you now occupy was but a few short years ago a "howling wilderness," where the wild beasts of the forest, roaming at will, and the screaming loon, as he passed from lake to lake, was about the only sign of animal life that accosted the eye or ear of the forest explorer. Had you been here as early as many of us now seated in this hall, instead of the modest little village clustered down here on the banks of the Molunkus, you would have found simply one log cabin and an old dilapidated saw mill. A little later and you would have found our forest dotted with here and there a little opening with perhaps a log cabin in one corner, with the wife and children cultivating a rude yet prolific vegetable garden, while the husband plied his sturdy blows to the felling of those giants of the forest, which, however wanton it might appear, was a necessary destruction before we could make the wilderness "blossom as a rose." And though we are just emerging from the rough and uncouth concomitants of pioneer life to a more advanced stage of civilization, we would not convey to you the idea that we have either cause or desire to repine at the moderate progress we have made since we settled down here in the forest; for we would rather move on in the line of progress—we would rather reach out our hands and grasp the blessings which nature has placed within our reach when aided by intelligence and by well-directed effort. To gain some fresh instalments of that intelligence so necessary to ultimate success in agricultural life, is just why we have invited you hither. So you see we frankly admit the selfishness of our purpose, for we have got you here that we may profit thereby. And yet I know I should do injustice to those for whom I speak if I did not as frankly admit that we expect on this occasion to combine *pleasure* with *profit.* For with intelligent minds and sympathetic hearts, the pleasures of social intercourse are among the choicest gems of civilization. They are indeed jewels which, in after-life, sparkle even amid the gloom of disease, and send forth their brilliancy from the midnight watches of despair. And though the pathway of life's pilgrimage be sometimes strew with thorns, yet the pleasures of memory will oft times cross that pathway, with the torch of social intercourse, to guide our steps to a higher plane of human improvement.

> "Long may our hearts with these memories be filled
> Like the vase in which roses have once been distilled.
> You may break, you may ruin the vase if you will,
> But the scent of the roses will cling to it still."

And now, Mr. President and gentlemen, as I cannot treat you to any grand display of rhetoric, or lofty flights of eloquence, allow me again to bid you a cordial welcome to our locality. Welcome to our mountain and forest scenery—welcome to our hill-sides and our valleys—and welcome, thrice welcome, to our homes and our firesides, to our homely yet frugal fare.

President Wiggin introduced the subject of the day, Stock Husbandry, by explaining that while he knew the long standing course of Aroostook agriculture, the raising of crops for sale, was correct in its way, yet it is now time to set that aside and substitute a stock husbandry. This calls for the feeding of products to stock on the farm in place of selling them, and furnishes a manure product with which to keep up the fertility of the land.

Secretary Gilbert pursued the subject further and at length, under the head of the relation of stock to good farming, improved stock, how to obtain it, and how to feed it.

In the afternoon, L. K. Litchfield of Winthrop presented the subject of dairying, and referred to the history of the introduction of associated dairying into the State, and showed how the business had been developed wherever associations had been well established.

THE IRON-CLAD TREE FRUITS.

By T. H. Hoskins, M. D.

There seems to be a disposition, in the minds of many who have not given the subject much attention, to think lightly and speak slightingly of what are called the iron-clad class of fruits. An idea is prevalent, among fruit-growers, that these are at most mere make-shifts, of little value and less importance. Nothing could be more mistaken than such an opinion. Fully half of New England, all of the provinces of New Brunswick and Quebec, a large part of Ontario, one-fourth of New York, all of Wisconsin, the Northern Peninsula of Michigan, Manitoba, Minnesota, Dakota, Northern Illinois and Iowa, Montana, Wyoming and Eastern Washington must grow the iron-clads, or nothing. A matter of such vital importance, affecting one-third of the United States and three-fourths of the Dominion of Canada, deserves all, and more than all the attention that is being given to it, for no country, however fertile and productive of annual crops, will ever be attractive, or desirable for settlement, without the possibility of orchards. A farmstead is never complete, never in the full sense a home, that is destitute of fruit trees. Therefore there is no more philanthropic work than that which is being given to secure such a blessing to the rapidly increasing population of what has been designated as "the cold North." This territory is appropriately bounded on the south by the minimum isotherm of 25 degrees below the zero of Fahrenheit's thermometer. When that line, going north, is passed, we enter upon the pomological region of the cold North.

It is not necessary to enlarge much upon the

IMPORTANCE OF NATIVE FRUIT

To any farming section. No one bred in a fruit-growing region is willing to emigrate to where fruit-growing is impossible, no matter how rich the soil, or how productive of animal vegetation. When they do so emigrate, the longing at once begins—as strong as that of the Israelites in the wilderness for the flesh-pots of Egypt—for the abundant tree-fruits of the old home, so little thought of while freely enjoyed. So great is the hankering after apples in such sections that the poorest crabs are held to be a luxury, and often command five or six times the price of first-class apples where these grow. Unfortunately, the tree fruits brought into North America by the early settlers from Western Europe were of a race incapable of enduring the severities of winter's cold in the cold North. Canada lies in the latitude of France, within the parallels of 42° and 51° north, and the summer climate is quite as warm. But the winters average about 20° colder, and very few of the tree fruits of France will endure the winters of Canada. Old England lies far to the north of New England, yet its winter climate is even less severe than that of Virginia. In selecting the improved fruits of Western Europe, its inhabitants were not obliged to consider the power to resist winter's cold as any factor in that choice, since the tenderest were hardy enough to endure a climate where the thermometer rarely sank as low as zero. For the first time the English race encountered this problem in North America, and the terms

"HARDY," AND "NOT HARDY,"

Began to enter into the language of Anglo-Saxon pomology. Probably no question is more often asked by fruit-growers in our northern States, in reference to a new fruit, than this: "Is it a hardy tree?" If not, they reject it, however good the fruit, for they know that the planter of an unhardy fruit tree is surer of vexation than of satisfaction in its culture.

Fortunately some English apples, and some of the pears, plums, and cherries of Western Europe, proved capable of enduring the climate of the early settled parts of our country, but it needs only a cursory glance over our pomological history to satisfy the inquirer that the seedlings were usually

BETTER THAN THEIR PARENTS,

And to-day almost every valuable apple, and many of the best of the other tree fruits grown in our country, are of native origin. Of course the term "hardy" is relative, and only sufficient of this quality is demanded, anywhere, to answer the requirements of that locality. But as settlements began to be pushed northwards, into New Hampshire, Vermont and Maine, a range downward of the winter temperature was encountered, and many kinds of fruit that throve well and yielded bountifully in Massachusetts and Connecticut entirely failed a hundred miles northward of those States. The settlers even in

SOUTHWESTERN MAINE

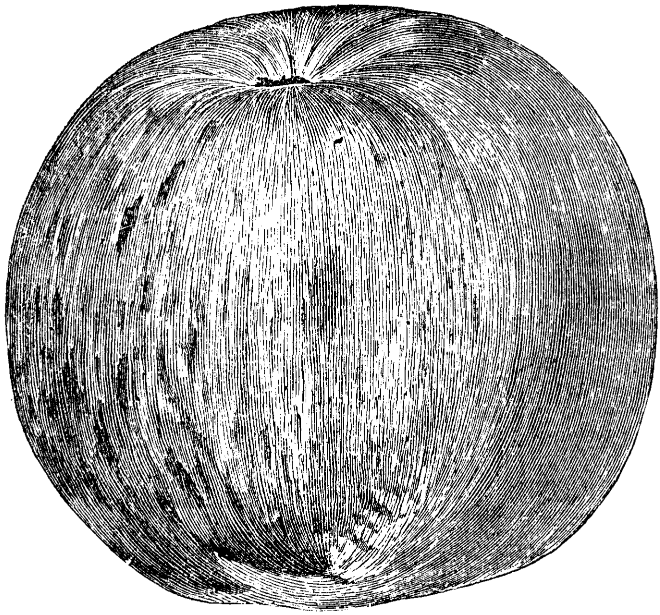
Noted some difference, and, as the settlements extended northward, more and more varieties, valued southward, had to be dropped from cultivation. Then, again, there was a falling back upon seedlings, and to-day the best apples of central Maine are of native origin. How far and how rapidly this increasing hardiness of tree-fruit seedlings from the stocks of Western Europe can be carried on, is not yet demonstrated, but certainly the process has been too slow for the

NORTHWARD PRESSURE OF POPULATION,

And there are many localities, even in Maine, very poorly provided with tree fruits suited to their climate. I am a firm believer in the importance of growing seedlings, and urge it upon every one. All may be encouraged to experiment in this way by the production of iron-clad apples, like the now well-known Wealthy, from Maine-grown apple seed. But we cannot ignore the fact that our ancestors of two or three generations back grew seedling apples because there were no nurseries and no tree agents, and very little skill in grafting, or any sort of orchard lore. Then, growing seedlings was the easiest thing to do, and everybody did it. Now it is easier to buy of the peddler, and everybody does that. But a way out of every difficulty has been provided for mankind as fast as the difficulties arose and became pressing, and providentially a way has been opened by which fruit trees of great resisting power against winter's cold may be had without waiting for the slow progress of seedling experiments.

RUSSIAN FRUITS.

Sixty years ago, very little was known in America about Russia, a vast country occupying the northeastern portion of Europe, extending from the 45° to the 68° of north latitude. But about that time, some very beautiful and productive varieties of Russian apples, growing in Sweden, attracted the attention of English travellers, and trees of them were carried to England. These varieties soon found their way from England to America, and New England received (first, I believe,) the Red and the White Astrachan, the Duchess



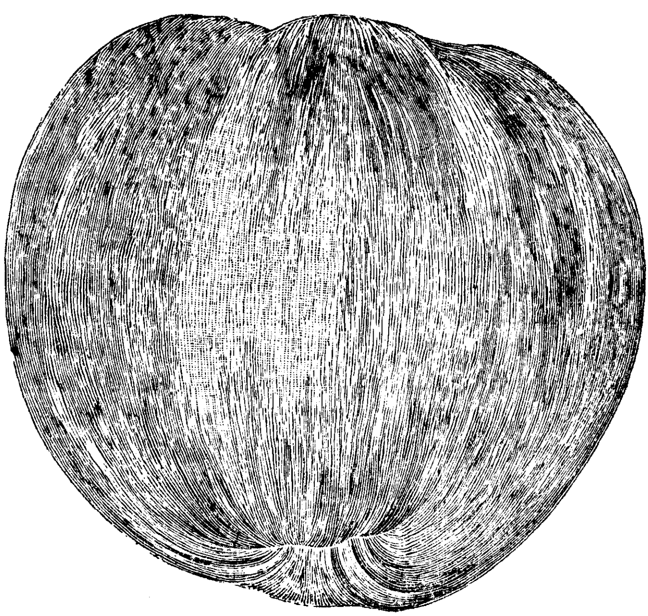
Vargul.

of Oldenburgh, the Alexander and Tetofsky. This was about 1830, and it is rather astonishing to know that without high quality in any one of them, these Russian apples in a few years, (or rather, three out of the five,) were known and planted from one end of the country to the other, and that to-day those three are starred as high, or higher, in our pomological records, and for more States, than the best of our native apples of the same season. Unquestionably they were selected for their

BEAUTY, SIZE, AND PRODUCTIVENESS,

Rather than for their quality as dessert apples, and as they are all merely good culinary fruit, and of short duration, the belief has been widespread that keeping apples and dessert apples are alike unknown in Russian orchards. This was a pretty hasty conclusion to come to, but, having been reached, it has so fixed itself in the public mind as to be with difficulty eradicated, even among fruit-growers and nurserymen, who might be supposed capable of a consciousness of the narrow limits of our knowledge in regard to the question.

In the wide distribution of the Red Astrachan, Alexander and Duchess of Oldenburgh, it soon began to be noticed that they were very hardy, and nurserymen began to recommend them for cold localities, where tender sorts failed. Working northward in this way, these sorts soon got their respective grades in hardiness, thus: 1, Red Astrachan; 2, Alexander; 3, Duchess; the latter as yet finding no climate that it will not endure. These tests showed that while these Russians were all hardier than American apples as a class, they were not all "iron-clad;" and subsequent research has revealed the fact (as might be expected) that Russian apples vary in hardiness. Astrachan is a province of the extreme south of Russia, and the Red Astrachan apple will not endure cold much greater than 25° below zero. The Alexander is a member of the large "Aport"



Winter Aport.

family of Russian apples, natives of Middle Russia, and it is much injured by cold at 30° below zero. But the Duchess stands 40° below without harm.

This extreme resistance against cold naturally attracted attention in Minnesota, when that State was first being settled, and especially after an exceptionally cold winter had destroyed every tree in many young orchards, with the exception of the Duchess. Minnesota, it is needless to say, was at that time full of bright-minded, wide-awake men, seeking fourtune in the cold North; and one of these,

COL. D. A. RICHARDSON OF ST. PAUL,

Noting the peculiar and phenomenal hardiness of that Russian apple, was moved to seek out wider information in reference to the fruits of Russia. The result of his research was given by him in an address delivered at a meeting of the Fruit-Growers' Association of Minnesota at St. Paul, January 10, 1867,—19 years ago,—and it was that address which induced the then newly established Department of Agriculture to order and import specimen trees of 270 different varieties of Russian apples. Right here I wish to note one reason for the contempt heaped upon Russian apples by some writers. Just imagine, for instance, that nearly 300 kinds of our American apples, selecting even the best sorts of each of the States, are taken, say to the Argentine Republic of South America, to South Africa, Tasmania, New Zealand, or China, and the cions promiscuously distributed under governmental authority. How many of them would in fifteen years have found their proper location, and displayed their merits or demerits conclusively? What should we think of the fruit-growers of those countries who rushed into the public prints with wholesale condemnations of all American apples? And yet that is what otherwise intelligent men in this and other States are doing, in regard to the Russian apples. These very same men will speak instinctively of the very limited range and peculiar requirements of some of our very best and most profitable apples right here at home. It has been claimed (and justly) that the Baldwins and Roxbury Russets, natives of Eastern Massachusetts, are finer when grown in Southern Maine than in their native State. It is well known that the Yellow Bellflower is a very local apple, and the Newtown Pippin still more so,—and the very men who know this, and speak of it, are yet condemning the recently imported Russian apples, not one in forty of which has probably yet found its best locality in America, while not one of this last importation has yet been growing in American soil long enough to show what it will do in any place. With our agricultural colleges, our experiment stations, and the vast number of intelligent and zealous fruit-growers in the cold North, interchanging their experiences and having them recorded in the horticultural and pomological reports of more than twenty States and

Provinces, we are gathering material fast, upon which to base conclusions. But that long list, with more recent additions, cannot be thoroughly tested and sifted, so that each locality shall know what is best in it for that locality for twenty years, and any attempt at "snap judgments" upon the Russian fruits (most of which emanate from persons who have never tried or even seen more than half a dozen of them) is transparently futile and absurd.

It is a noteworthy fact that those who know the most about Russian apples think the best of them. Prof. Jos. L. Budd of the Iowa Agricultural College, is an old and experienced orchardist and nurseryman. After a long and careful trial of the hardiest apples of our native stock,—after planting several orchards of them only to see them destroyed by the "test-winters" of Iowa,—he has satisfied himself that the

GENUINE RUSSIAN APPLES

Are, if not a different species, at least a very much modified race from the apples of Europe. This is shown in their habit of growth, in the microscopic structure of their foliage, and even of their wood and bark. From all that can be gathered, it is probable that the apples of Asia and the apples of Europe have met on the great plains and in the long river valleys of Russia, and that the existing apple trees in that empire exhibit the characters of both races, and of all sorts of crosses between the two races. The varieties of the steppes (which are almost identical with our prairies in their geological as well as their geographical characteristics) show not only remarkable hardiness against the winter's cold, but also against fierce heat and long-continued drouth. These varieties are particularly suited to our northwest, while the apples of the Baltic Provinces and of Russian Finland will perhaps furnish the best varieties for Lower Canada, New Brunswick and Northern Maine.

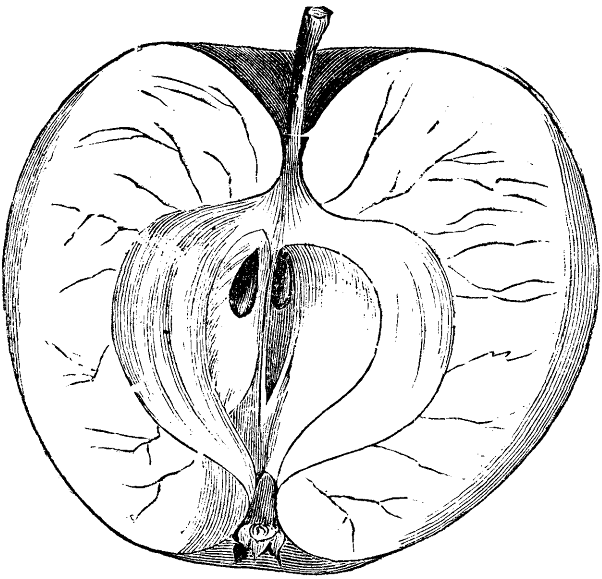
The chief criticisms urged against the Russian apples in America are that the quality is poor, and that they are not keepers. It is admitted that the fruit is handsome, and generally large, and that the trees are usually productive. These are the observations of persons possessing but a limited knowledge of this family of apples. The truth is that they vary in every way quite as much as American apples vary. They have in Russia as many, as bad, and as good apples as we have in America,—probably more, since Russia has been settled more thousands of years than the United States has been settled hundreds. No doubt the 300 varieties that have been brought here from Russia were a selection of the best known to those who collected them, though not necessarily the best in all Russia. Yet I am constrained to think that exceptional care and skill was shown in making this collection, from the fact that Prof. Budd and Mr. Gibb, in their travels through the fruit-growing provinces of Russia, found not more than half a dozen varieties which they regarded as of sufficient value to add to the list of those imported in 1870. But they did us great good in telling us which appear to be the best and most profitable kinds in that list. And they also enable us to understand the peculiarities of these fruits better, by the discovery that in Russia, as in this country, each section or region has its favorite fruits, and that single kinds are planted in large orchards for commercial purposes. A result from this is that seedlings from such orchards come very close to type, so that the leading Russian apples range themselves in groups or families of apples, very much alike in appearance, but differing in season, and in the vigor and productiveness of the trees. Thus, the Anis family of apples are all small, round, more or less completely red, of more or less good dessert quality and of varying season. The Aport family, on the contrary, are large, striped, more or less conical or oval; and are all fall or winter apples. The Alexander is an Aport, and Messrs. Budd and Gibb brought home at least two Aports that are keepers. Then there is the Transparent family, conical, yellow apples, from medium to large in size, mostly of great beauty and dessert quality, and all summer fruit. There is a large number of apples of the Duchess of Oldenburgh family, some of which are much better keepers than that variety, and also of better dessert quality. So far as present experience allows the expression of an opinion on the

VALUE OF RUSSIAN APPLES,

The following list will exhibit the judgment of experimentors, east and west. In making up this list I am guided not only by my own experience, but by reports and discussions in the horticultural societies of Iowa, Minnesota, Wisconsin, and the Province of Quebec.

SUMMER APPLES.

Yellow Transparent, White Transparent, Grand Sultan, Charlottenthaler, Sweet Pear, Summer Red Calville, Sugar Barbel, Tetofsky, Enomous.



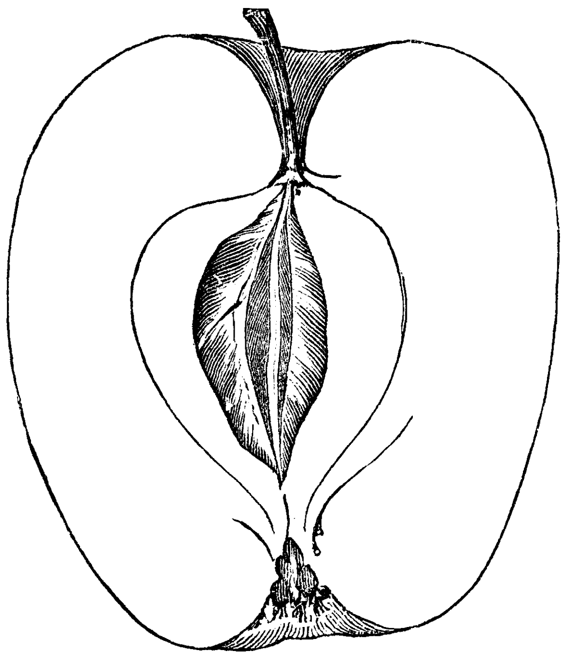
Borovinka.

The first five in this list are so nearly alike in fruit and in season as hardly to be distinguished, but Yellow Transparent seems to be the most vigorous tree. Summer Red Calville is apt to be strongly ribbed, but in quality approaches "best." Sugar Barbel is a small conical sweet apple, bright red, and of a fine flavor. Enomous is a most vigorous tree, fruit of the Alexander type, and probably the largest known apple of its season. Mr. A. Webster of East Roxbury, Vt., has grown it fourteen inches in circumference. There are a large number of other apples of this season in the government list, of which not much is reported.

FALL APPLES.

Duchess, Zolotoreff, Vasilis Largest, Golden White, Alexander, Noble Red Streak, Russian Gravenstein, Heidorn's Streaked, Cut Wine, Getman's Bean, Titovka, Borovinka, Charlamoff, Switzer.

Zolotoreff is like Duchess, but more oval, better and later. Vasilis Largest, similar; Borovinka, a late Duchess; Golden White, a large November apple, mild pleasant acid; Noble Red Streak, a honey sweet, medium size; Russian Gravenstein, much like the common Gravenstein; Heidorn's Streaked, a large, beautiful, sweet and



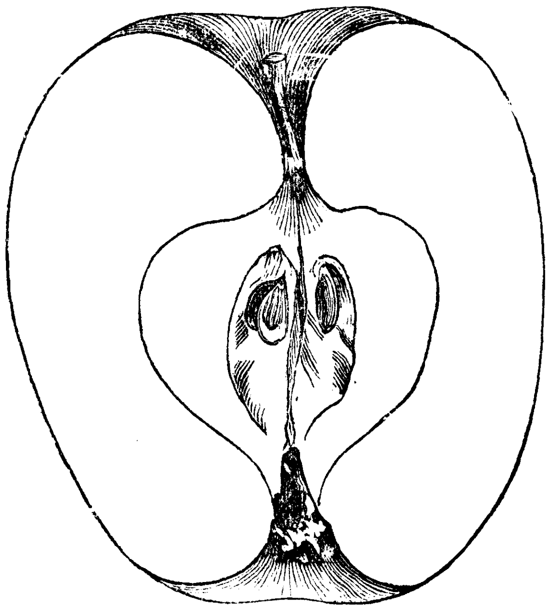
Titovka.

delicate apple; Cut Wine, much like Maiden's Blush, acid; Getman's Bean, large, striped, fine, crisp, most excellent flavor, a slow grower and tardy bearer; Titovka, a very valuable market fruit. Prof. Budd calls it "the market-woman and car-boy apple," along the Volga, Duchess type, but tender and very good. Charlamoff, also Duchess type, but more conical and better quality. Titovka and Charlamoff are much alike, and may be the same. Switzer, a large red dessert apple of fine quality, keeps nearly to December; tree productive, and a fine grower.

WINTER APPLES.

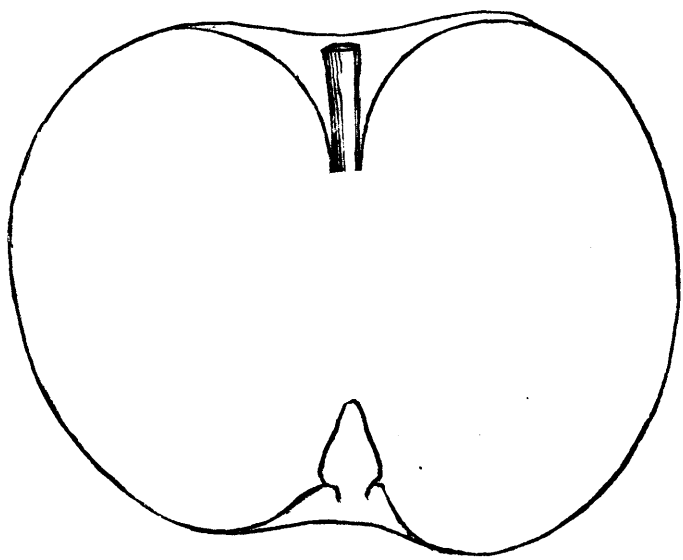
Antonovka, Longfield, Good Peasant, Blackwood, Cross Apple, Arabskoe, Reinette Kourski, Pink Anis, Red Anis, Winter Aport (two varieties), Tchougounka (Cast-Iron), Bogdanoff, Grandmother, Vargul, Lord's Apple, Red Queen, Tiesenhausen, Borsdorf, Little Seedling, White Russet, Oxtrokoff's Glass.

Antonovka is much like Grimes Golden, and is the leading market apple in Russian cities—"the king apple of the steppes." Immense orchards of it are planted, it being very productive, and always a cash article. Quality only fair, between Ben Davis and Baldwin.



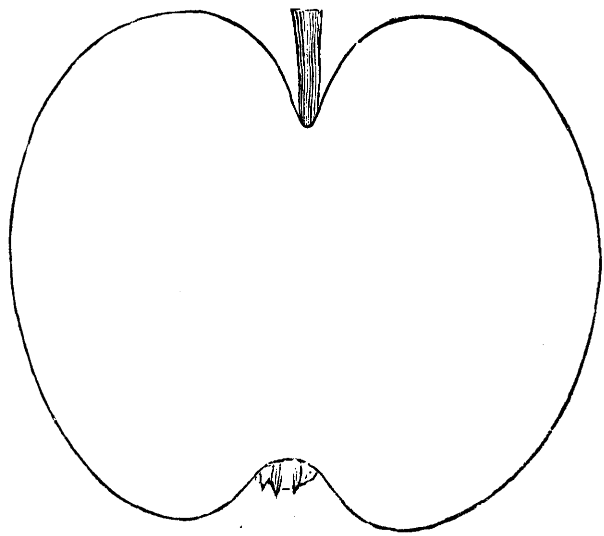
Antonovka.

Longfield, a very choice dessert apple, equal to Wealthy in quality and productiveness, but not in color, being yellow with red cheek, like Maiden's Blush; a good keeper. Good Peasant is very similar, and Blackwood, though differing in tree, is in fruit but a small Longfield. Cross Apple, according to Prof. Budd, "resembles a highly-colored and very large specimen of Limber Twig, but is much better in quality. Its fruit is kept in Russia until the new crop comes." Arabskoe; there seems to be an early and a late winter apple of this name. The former looks like a coarse Baldwin, the latter is described as a late keeper and much like Black Oxford, but larger. Reinette Kourski is a medium green apple with a red cheek, flesh white, tender, very good, keeps through the winter (Budd). Pink Anis and Red Anis, small apples of the Fameuse type, are the leading market apples on the upper Volga. Tree doubly iron-clad. The Winter Aports are of the Alexander type, one a good kitchen apple, the other (not so good a keeper) is "one of the best dessert apples." [Gibb.] Tchougounka, or cast-iron apple, accords with its name, and is said to keep two years. Bogdanoff is considered next to Antonovka for profit, and a better keeper; the fruit large and striped like St. Lawrence. Mr. Gibb thinks this likely to prove



Bogdanoff.

a very valuable variety. Grandmother, full medium size, yellow, with a little red, a fine dessert apple and long keeper. Vargul, "one of the most popular apples of Voronesh," large, yellowish green, with red cheek; flesh white, soft, juicy and somewhat acid, of agreeable brisk flavor; keeps all winter. Lord's Apple, quite large, like Blue Pearmain, fine texture, agreeable acid, keeps all winter. Red Queen, good size, keeps till March, quality good. Tiesenhausen looks like Ben Davis, of good quality, good keeper, very hardy tree. Borsdorf, medium size, conic, yellow and red, good keeper and very good quality, with a flavor like Peck's Pleasant. Little Seedling, medium size, greenish, very long keeper, fair quality. White Russet—Mr. H. H. Howlett, of Baraboo, Wis., calls this one of his very best market apples. Large yellow, with red cheek, a little russet around the stem. An early and abundant bearer, December to January. Ostrekoff's Glass is much like Rhode Island Greening, a large, handsome apple, and a good keeper.



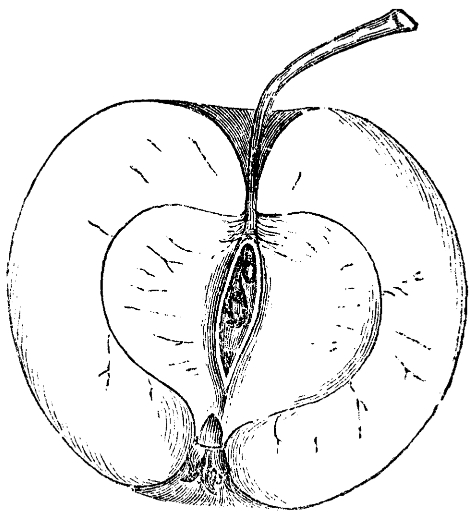
Ostrekoff's Glass.

To a great extent, of course, the values attached to the above list of apples can as yet be only provisional. On the other hand there are undoubtedly many others on the Russian list that will be found as good as any of them.

In addition to the Russian Iron-Clads, a considerable and rapidly increasing number of seedlings, native to the cold North, are rising into notice, and very rarely, but sometimes, a long-known sort is found on trial to be sufficiently hardy to be available. This last list, however, is so small, and the innumerable testings have resulted so unfavorably, that it is quite doubtful if, when all known sorts of the old stock have been tried, the result would prove of any practical value. The only apple native to Southern New England which has proved hardy with me is the Foundling, an early winter apple of good size and excellent dessert quality, originated in Groton, Mass. Of all the apples of Canada, though many of them are classed as hardy, only one, the Peach of Montreal, a fine September apple of dessert quality, is a true iron-clad, and Prof. Budd declares this to be a genuine Russian, which has reached Canada by the way of

France. The Fameuse and its various seedlings, including the St. Lawrence and the McIntosh Red, are only suited to the southern border of the "cold North." They suffer severely wherever the winter temperature goes much lower than 25° below zero.

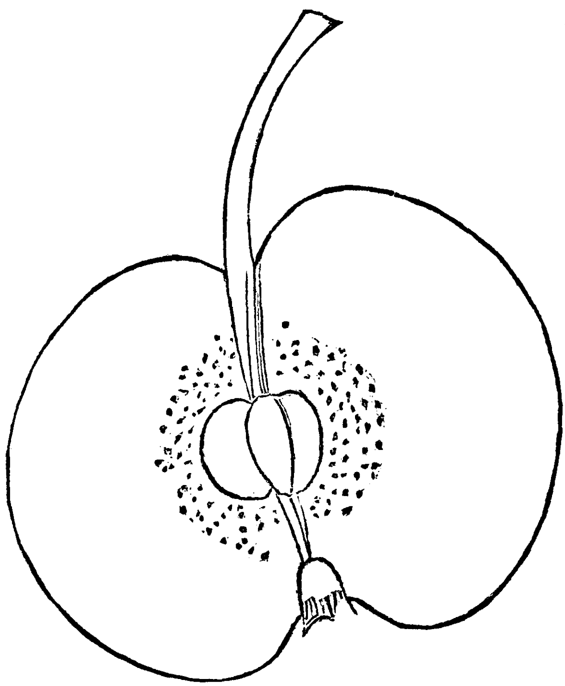
At present the American Seedlings which have shown themselves to belong to, or to approach, the iron-clad class, are (aside from the Wealthy), two or three new seedlings of Mr. Peter M. Gideon, the originator of the Wealthy, which have not yet passed out of his hands; Wolf River and McMahon's White, both large and handsome late fall or early winter sorts from Wisconsin; Rollins Pippin, Minnesota Greening and Giant Swaar, all of them winter apples of good size and very good quality, from Southern Minnesota; Whitney's No. 20, a small but very nice fall apple for all purposes, from Illinois; and Scott's Winter and Northfield Beauty, from Northern Vermont, the first a long keeper of medium size and good quality, the second a choice early winter dessert apple. All the above-named American seedlings are productive, and according to my observation this characteristic is far more common among the iron-clads than among other apples—as is also beauty of color, the Russians, especially, vieing in brilliancy of tint with the Siberian crabs.



Longfield.

RUSSIAN PEARS.

The winter of 1884–85 destroyed my last hope that any of the known European or American pears would endure the severer winters of the cold North. Some twenty of the hardiest sorts, several of which had attained bearing size, and one of which was a native seedling that in an exposed place had stood twenty-five winters, were all wiped out. Were it not that two years before Prof. Budd had sent me small trees of several of the pears of Central Russia, which bore the test unharmed and the past summer made a most vigorous growth, I should have given up all hopes of success in pear-growing.

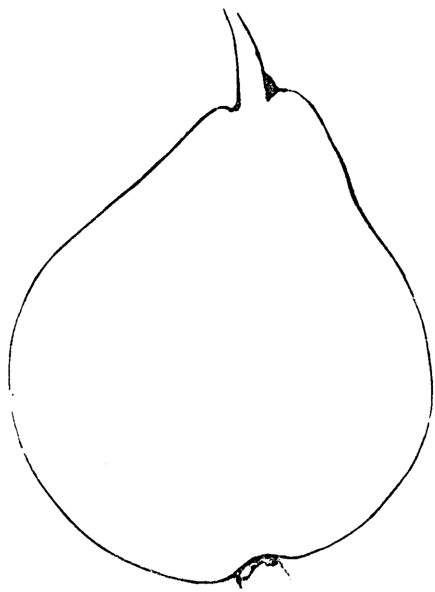


Bergamot Pear.

But with these Russians from 55° and 60° of north latitude I take courage, and am willing to try again. These Russian pears are evidently of a distinct race, as plainly shown by their wood and foliage. Pear-growing has not been carried to that point of perfection in Eastern Europe to which Van Mons and other horticulturists brought it along the Atlantic slope of that continent, and the number of dessert varieties are much fewer and do not reach so high a level of quality, or so large a size, as the best and largest of our standard pears. Yet the Russians have some very meritorious pears, which they grow in large quantities for market, and were found profusely, in their season, by Messrs. Budd and Gibb in their travels. I will merely give here Prof. Budd's estimate of these pears.

Bergamotte Sapieganka. This fine pear originated in Northern Poland. Without doubt it has an admixture of the wild forest pear of that country. At Vilna, Russia, and at other points, we saw perfectly healthy trees over forty years of age, loaded with as perfect fruit as I have seen in any country. Though not as large, it is equal in quality to Flemish Beauty, which is common in Southern Poland, but not successful as far north as Vilna.

Bessemianka. This is beyond doubt a true descendant of the wild pear of Russia. The name means "seedless," and it is rare indeed that more than the rudiment of a seed can be found. It is medium or small in size, pleasant and satisfying in quality, but not strictly melting. Taken all in all, it is the best dessert pear found in the far interior and on the Northern Steppes. Literally, it grows from the gulf of the Volga as far north as Moscow and Kazan.



Bessemianka Pear.

Red Bergamotte. This is a medium-sized, flattened pear, common in Poland and South Russia. [All of Russia is north of the United States.] It was the pear sold mainly on the trains, the last of September, from Koursk to Warsaw. The tree is vigorous and hardy, and the fruit is of fine quality.

Tonkavetka. Like the "Seedless," this will grow anywhere in Central Russia. It is hardier than the Duchess apple. The fruit is only fair for eating, but best for cooking.

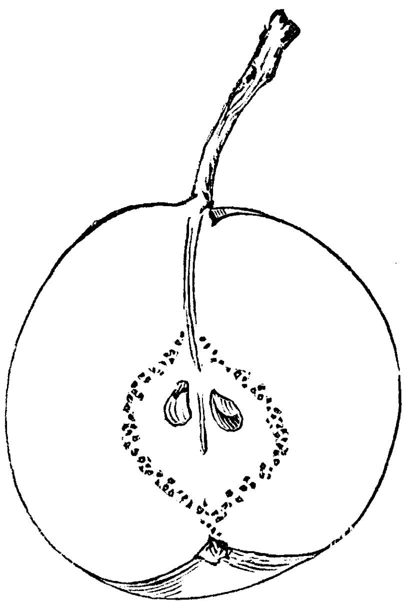
Pfundbirne (Pound Pear). This is a large-sized cooking pear, of excellent quality for that purpose. It has a strong, healthy leaf, and is a vigorous grower.

Fondante de Bois. This is sometimes given as a synonym of the Flemish Beauty, but Messrs. Budd and Gibb saw a quite different and much more hardy pear growing at Moscow and Wilna under this name, of fine quality and a heavy bearer, "but surely not Flemish Beauty," says Prof. Budd.

Saharnaya (Sugar Pear). Mr. Gibb says "Warsaw, Riga, Orel and other Russian cities all have their sugar pears," not all quite the same, but all productive, fair for eating, and good for cooking.

Passovka is a hardy Polish pear, considerably planted. The fruit is long, narrow, yellow, often with a red cheek, of fair size, very pretty, good quality, ripens in August.

It is a remarkable fact that the true pear is a wild forest tree far north in Russia. The fruit is usually uneatable, at least in the raw state, and about the size of a common crab apple. The tree grows to a large size and endures the climate like the poplars and birches. In the Public Square of Simbirsk, lat. 54° on the Volga, a climate as severe as the city of Quebec, says Mr. Gibb, the wild pear is a fine ornamental tree. There are two forms, one with smooth-edged leaves, and another with leaves serrated. These wild pears Mr. Gibbs thinks likely to make the best stocks to use here for the improved Russian pears, and quite a large quantity of the seed has been imported with that view. I have a number, three years old, from imported seed. I also have some twenty sorts of the hardiest Russian and Polish pears of the same age, and shall therefore be able to report from personal knowledge in a few years as to their endurance of our northern climate. They are fine growers and several are already upwards of six feet high.



Sapieganka Pear.

IRON-CLAD CHERRIES.

Messrs. Budd and Gibb have collected and brought home a considerable number of the best kinds of North German and Russian iron-clad cherries which are likely to be invaluable to Northern New England. These cherries of Northeastern Europe are of the Griotte or Mazzard class, but far more improved, and with a much hardier tree than the Mazzard of Western Europe, with which we are already acquainted. One of this class has been brought into Minnesota by German immigrants, and has shown remarkable hardiness and productiveness whenever planted in that State. This is he Ostheim, of which Mr. Gibb says, "In color the Ostheim is a dark red, becoming when very ripe a dark purplish red. When we tasted it at Warsaw we found it but mildly acid and rather rich. It is of good size, tree vigorous and productive." I have a few trees received from Minnesota as Ostheim, which have not yet fruited, but which passed through the last severe winter uninjured. I am yet in doubt whether they are the true Ostheim, or a smaller seedling of that variety, said to be grown in Minnesota. Another iron-clad cherry of the same class, the Lieb, has also proved hardy and has borne some fruit, not very large ; yellow, with a red cheek, very pleasant and sweet. But the

LEADING RUSSIAN CHERRY,

Grown so extensively for market in that country, is the Vladimir. This fruit, says Mr. Gibb, we saw not only in the markets, but sold in the streets in all the larger towns. In the government of Vladimir more than one hundred men have orchards of this cherry, with 15,000 trees each. Whole cars, and sometimes entire trains, are loaded with this fruit for transportation to Moscow, St. Petersburg and the other large cities of Russia. The tree is of bush form, and when it becomes too old to bear profitably the older parts are cut away and new sprouts take their place. The seedlings vary somewhat, and there is, therefore, a choice in varieties, although the type is closely preserved. As a rule, the flesh is a deep purplish red ; the skin, when fully ripe, reddish black. When fully ripe the flavor is a rich mingling of acid and sweetness.

Brown Brussels is another dwarf habit of tree and similar foliage. Fruit large to very large, a dark red, a rich acid cherry. On account of its large size, it sells at one-fourth more than Ostheim in the Warsaw market, but the tree is less hardy.

Double Nate is another very delicate and favorite kind, a great bearer, reported hardy at Orel.

RUSSIAN PLUMS.

On these I quote Mr. Gibb, as the few trees I have of them have not yet produced fruit, though they passed safely through last winter and made an immense growth during the summer. Mr. Gibb says :

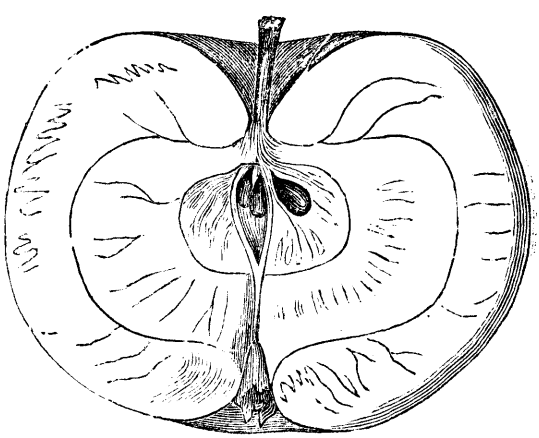
—"In our most northern rambles in Central Russia we find the plum grown in fair quality. In the severe climates of Moscow, Vladimir and Kazan, we find plums, and some of them of really fine quality. These plums belong to a family more or less nearly related to the Prune plums of Germany and Hungary. Like the Vladimir cherry, these northern forms of the plum are dwarf in habit of tree, and this seems to be a provision of nature, for in those cold climates if a plum bush is killed to the ground new shoots soon grow and bear. Of these plums there is great variety; some are red, others yellow, but mostly blue. They differ widely in flavor; some are equal to Lombard; some are early, some late. They are usually free-stone, and without astringency. I was not prepared to find such plums in Russia. These non-astringent, fleshy, free-stone Russians, have a combination of good qualities which entitle them to extensive trial in our cold country.

The Russian plums are grown, no doubt, sometimes from seed, but usually from suckers. Most of the horticultural gardens and nurseries have made small collections of the best they have found. By obtaining roots of these we may get the best of these Russian seedlings. One of the commonest in the northern markets is a long, dark dull red, prune-shaped plum, not rich, but non-astringent and a really good cooking fruit. Mr. Shroeder has six kinds he recommends. The Volga valley also has a plentiful supply of plums. At Simbirsk we found them in great quantity and variety. At Voronesh Mr. Fischer specially recommends the Moldavka, a large violet plum of medium quality and very productive; I counted 150 plums on one branch. At Tula we found quite a variety in the peasants' orchards, and among them a Russian Reine Claude, a family of them, red, white and blue. They are of extra quality, but in the cold climate of Tula they are planted at an angle of 45 degrees, or less, and bent down to the ground before the snow falls. Thus protected they bear bountifully." [This is the practice of Mr. F. P. Sharpe, of Woodstock, N. B., in his large orchards, of the Mooer's Arctic plum, from which he ships fruit by the thousand bushels. The practice is by no means difficult or costly.] "A whitish plum, known as the White Hungarian, has also proved successful. At Koursk we found the Reine Claudes planted freely, but unless laid down they are not reliable."

The Wild Plum of Russia, *Prunus Spinosa,* is very interesting. There is a large fruited variety of it, round and blue, which Mr.

Gibb says is far better for cooking than the Canada Wild Plum, and also a dwarf variety, which should be introduced into our gardens as an ornamental curiosity—little round-headed bushes not more than 18 inches in height, loaded with lovely blue fruit, strikingly curious and beautiful.

I have endeavored, in this paper, to give a fuller and clearer description of the iron-clad, and especially of the Russian fruits, than has ever before been published in Maine. So very large a portion of the State is above the line of profitable or even possible tree-fruit culture, with the species and varieties successful in lower New England, that 20,000 square miles must depend upon other than home-grown fruit of this class, unless those of a much hardier nature can be had. Almost if not quite alone in New England, I have spent the last nineteen years in the study of this question. When, in 1866, I came to Northeastern Vermont, I was astonished to find that there were no orchards, and to be assured that not even apples, with the exception of Siberian crabs, could be grown in the otherwise rich and fruitful counties of Caledonia, Orleans and Essex, or in the adjoining Eastern townships of the Province of Quebec.



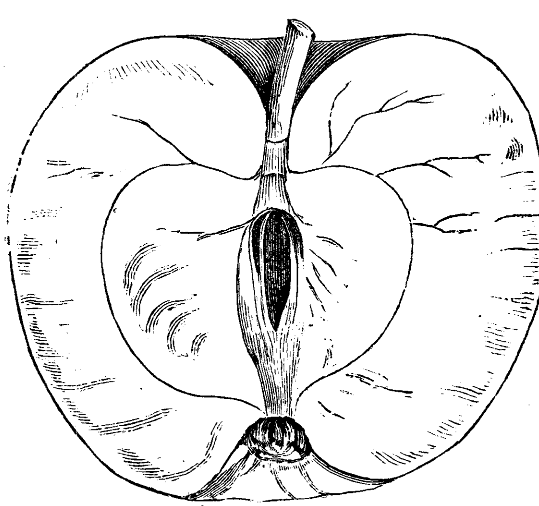
Anis Alui.

I immediately began making collections of everything called "hardy" in the way of tree-fruits, but although I occasionally came upon a kind that would partially endure the climate, and give some fruit, my first real success came when I planted the Russian Duchess of Oldenburg and Tetofsky. The White Astrachan also proved iron-clad, but a poor bearer; the other Russians of the first importation (Red Astrachan and Alexander) not being quite so hardy. When, therefore, in 1870, the United States Department of Agriculture imported the long list of 252 Russian varieties of apples, I eagerly applied for scions. I got only seventeen kinds, but of these seven or eight proved valuable. I have since sought, by correspondence and reading, to learn all that could be learned regarding the rest of the list, and to procure scions of such as promised to be of value. The result of my studies to date are briefly summarized in this paper.

Among those who may read what I have written, there will naturally arise the enquiry, Where can these Russian fruits be had? I therefore will now give a list of those persons who have been most active in importing and propagating and testing the Russian fruits.

Prof. Joseph L. Budd, State Agricultural College, Ames, Iowa.
Mr. Charles Gibb, Abbottsford, Quebec.
A. G. Tuttle, Baraboo, Wisconsin.
H. H. Howlett, " "
A. W. Sias, Rochester, Minnesota.
Underwood & Emery, Lake City, Minnesota.
Peter M. Gideon, State Experimental Farm, Excelsior, Minn.
E. Myer, St. Peter, Minn. [Ostheim Cherry.]
Wm. P. Rupert, Seneca, Ontario Co., New York.
Elwanger & Barry, Rochester, New York.
Aaron Webster, South Northfield, Vermont.

And now permit me, in closing, to add a few words in reference to the fruit-growing capabilities of Northeastern Maine. With the fertile soil and geological structure of Western New York and Northeastern Ohio—the best fruit-growing sections of America,—Aroostook's hindrance to success in the culture of the tree fruits lies solely in the severity of her winters. Overcome this, and that great valley of the upper St. John, with an easy outlet to the sea northward through the St. Lawrence, and southward to Bangor and Portland, will be better situated for orcharding than the sections named, because so much nearer the



Rabuschkine.

European markets which our fruit growers are more and more seeking.

With the Russian fruits, and the seedlings and crosses which will soon be grown from them, the difficulty of climate is completely overcome. There is hardly an apple on the whole Russian list that is not more hardy in Aroostook than the Baldwin in Southern Maine. The long list of Russian apples has not yet been thoroughly sifted, but in it, and in the Iron-Clad American seedlings, there are already enough to begin upon most hopefully. It will be perfectly safe to plant out large orchards of the Wealthy, the Longfield, the Antonovka and the Bogdanoff, all large, good and beautiful shipping apples, of good keeping qualities when grown so far north. The Iron-Clad plums, pears and cherries are of less commercial importance, but their cultivation for home use should not be overlooked. There is a grand future opening for Northern Maine. Let this generation of its people lay the foundations of it broad and deep, so that its work shall be remembered when Maine is known the Nation over as the "Empire State of New England."

Institute at Fort Fairfield.

The Institute for Northern Aroostook was held at Fort Fairfield, October 23.

After an address of welcome, the subject of dairying in its adaptation to Northern Aroostook was taken up and made the leading subject of the day. In the evening J. E. Bennoch, member from Penobscot County, read a paper on Selection and Management of Fruit Trees. No report of this meeting is given.

ADDRESS OF WELCOME.

By H. C. Townsend.

Mr. President, and Gentlemen of the Board of Agriculture:

The duty having fallen upon me to extend to you a cordial and earnest welcome in behalf of the farmers of the immediate vicinity, and of the Fort Fairfield Grange, allow me in justness to them to inform you that there are many present whose practical experience in farming, as well as in public speaking, would enable them to extend to you a more fitting welcome than I.

Although many are feeling a little discouraged in consequence of a partial failure of our staple crop—potatoes—yet a retrospect of the year is, I think, full of encouragement.

Recent efforts of improvement are displaying gratifying results both in the field and farm-yard, and we trust a new era is dawning upon this naturally beautiful and productive section.

The march of progress is onward, and a more intelligent and earnest interest seems to surround and stimulate our agricultural as well as social affairs, with each succeeding year.

This gives us courage in the belief that in our calling we are rising from the level of unintellectual work to the higher plane of a noble occupation. To-day we meet to receive instructions in furtherance of our cause, from those whom we know are authority upon many of the problems connected with agriculture, with a determination to be benefited thereby as much as our capabilities will admit.

Realizing to a certain extent the importance of agricultural meetings as a disseminator of knowledge in our business, we have looked forward to the present occasion as one of instruction and of practical benefit, whereby important ideas would be advanced by gentlemen whose experience in the subjects treated would fully warrant their reception by us. It is not, then, through curiosity that we have assembled, but with minds susceptible, we trust, to receive the instruction which we are free to admit at the present time is much needed, and apply in a manner worthy of the source from whence it is derived.

This section is sometimes called the "Garden of Maine," and from the natural capabilities of its soil the appellation may be appropriate. The question which above all interests many, and should all connected with Aroostook agriculture, is how to retain the title. And you gentlemen are to speak to-day upon a subject of great importance in connection with the same.

Much has already been said and written upon the policy of raising potatoes to the extent heretofore done, as well as upon the advantages derived from their cultivation in smoothing the rough fields and fitting them for the improved machinery which science is so generously placing at command. But the time has now arrived whereby many are realizing that the business has been overdone. By glancing at the past history of agriculture they may well and wisely come to this conclusion.

But a little over two hundred and fifty years ago the Pilgrim Fathers landed in Massachusetts. They found a soil hard to cultivate, yet rich and productive of good crops. This they cultivated, following the general routine that their fathers followed in the mother country, and paying little if any heed to the permanence of its fertility. Gradually their crops indicated a decrease in the fertilizing elements of the soil and many of the younger generation turned their steps to lands adjacent to the Connecticut River. Here the lands, except upon the intervals which had received the wash of upland forests for countless ages, lessened in productiveness, and by slow degrees the tide of emigration passed to the fertile valleys of the Mohawk and Genessee.

Here a paradise was found, a soil whose richness was surely permanent. The haven of their hopes had been reached, a land flowing with milk and honey such as their rock-bound vision had never even hoped to see. Here could they and the generations to follow gather from a soil of inexhaustible fertility, and treasure up the requisite wealth to nurture declining years. Notwithstanding their experience in their former homes, notwithstanding the failure of their fathers' soils, in spite of the positive teachings of the past, they gathered little wisdom from experience, and, though honest, frugal and industrious, paid little attention to anything beyond the mere manual labor connected with farm life. They were in no sense practical farmers. The soil received the same treatment that had been given to the soil of New England, which resulted in a corresponding diminution of fertility. The lands in the Genessee valley were once classed with the richest in natural fertility in the world, producing average crops of forty to fifty bushels of wheat per acre. The present average of this valley is now below twenty.

The western emigration adds another illustration as to the importance of husbanding the fertility of our soils, or at least keeping them in a condition to manufacture the materials which nature has in store, as well as to retain and appropriate the artificial ones which may be applied.

In all the older parts of the West where there are no natural means of returning to the soil the elements removed in their large crops of wheat and corn, a perceptible diminution in yield is apparent.

And thus we find in Aroostook County, that under this continued potato-cropping, our lands are becoming exhausted in a perceptible measure of their large stores of potash.

This element is as essential to the production of large crops of hay as of potatoes, one ton requiring 44 lbs. of potash, which is the amount science demonstrates 132 bushels of potatoes to contain.

This must be more carefully husbanded in future or necessarily become insufficient to produce many other crops not requiring so much potash as the potato, but with equal labor, yielding a larger margin of profit. The disintegration of coarse materials by the action of atmosphere, of moisture, of frost and other natural agencies, is annually supplying a certain amount of plant food, but this is insufficient, if our fields be cropped year after year without supplying to a certain extent the elements removed, to leave the margin of profit which we all so much desire.

This margin without question may be ours to enjoy if we but labor in accordance with the principles which science has demonstrated, practically as well as theoretically, to lie at the foundation of all true agriculture. Our expensive means of transportation prohibit the use of commercial fertilizers to the extent which has proven satisfactory in other sections. Our inland situation deprives us of the nitrogenous fertilizers which are eliminated in the various extensive fishery operations on the coast.

From whence, then, are we to derive the elements necessary to the permanence of the fertility of our soil? Shall it not be by using our products where they are produced, by judiciously feeding them to stock in its various forms, returning the excrement and in a measure the bodies or their equivalent in nitrogen and phosphoric acid, thus restoring to the soil in a form suited for future growth those elements which the earth in the mysterious processes of her vast manufactory had contributed to vegetable and animal life?

Science as well as experience has demonstrated that with this treatment not only the natural fertility may be maintained, but greatly increased, while at the same time yielding the husbandman ample returns for his labor. The new civilization with which this latter part of the nineteenth century is being propelled with wonderful rapidity has had a marked effect in dispelling hosts of skeptics in science as applied to agriculture, instilling new ideas and elevating the business in all its bearings. Many in this section, and even in your presence to-day, realize that the principles which this knowledge has demonstrated to be of primary importance to the tiller of the soil, must *sometime*, and ought *now* to be adopted, yet they still linger upon the threshold of a departure from the system of former years—a system which, though profitable upon virgin soil, would eventually bankrupt mother earth.

Science informs us that by a judicious system of rotation the productive capacity of our farms may be increased.

Nature is ever busy in her work of transformation and the available elements which may have been appropriated in the growth of a certain plant, may after a series of years exist in sufficient quantities to nurture the same plant. Hence we may be led to the reasonable conclusion that by following one crop by another, whose main element of nourishment is different, we may so work in accordance with nature that her storehouse will be constantly supplied, that after a series of years we may again profitably return to to the production of the crop previously produced, and find her amply prepared to furnish the requisite materials for the same. Thousands of dollars are paid annually by the farmers of Maine for nitrogen in some form, it being the most costly, as well as an indispensable manurial agent.

It forms a large proportion of the air we breathe, yet no plant can obtain it from that source. It must reach them through the soil. Nature has placed at our disposal a certain plant in the form of clover, which is particularly adapted to store up this important element, while at the same time yielding a margin of profit as a forage crop.

Would it not be well for the farmers of even this fertile Aroostook valley to apply a little more science in their avocation, and thus aid nature in rendering available that fertilizer which is of such great importance in the profitable production of nearly every plant, and which is costing the farmers of many sections of our State so much for immediate supply.

In closing, let me remark that although we are well supplied with reading of an agricultural nature yet we are aware of the fact that it does not accomplish what it might or ought. I will briefly mention one reason for this, not by way of excuse, but that attention may be called to our dilemma, and thereby a channel be opened to remove it. Our system of agriculture is such that people have accustomed themselves to continuous drudgery, which, when the body is at rest, has unfitted the mind to receive and retain that amount of instruction which it otherwise might. The continuous cropping which is so universally practiced here calls not only for hard, untiring labor from early spring till late autumn, but even the spare days of winter are few, so multifarious are the duties which necessarily arise in the business connected with this comparatively new country. We are not unmindful of the fact that under any system of cultivation many difficulties must be surmounted before enjoying to its full extent the fruits of our labor.

A large portion of our forests have been felled and converted into fruitful fields whose luxuriant verdure attracts the attention of those who visit this famed land of "buckwheat cakes and cedar shingles." And not only has a large percentage of the virgin forests been removed, but a large portion of the cleared land has been fitted for successful cultivation by means of improved machinery.

And now comes the question: Can we not rest, at least partially, from the continuous toil which has been our lot, and enjoy the fruits of our labor? Not only enjoy the fruits, but under a new system can we not find more time for social and intellectual culture that will so enable us to direct our pursuits by the application of more brain and less physical labor, to the end that the fruits thereof may be increased many fold?

PISCATAQUIS COUNTY.

Institute at Dover.

The Institute for Piscataquis County was held at Mayo's Hall, Dover, October 28th, with a full attendance. Central Grange furnished entertainment for all present. The local member of the Board, O. T. Goodridge, presided.

At the opening an address of welcome was given by Thomas Daggett of Foxcroft, in behalf of the citizens of the county and of Central Grange.

In replying to this address of welcome, Secretary Gilbert took occasion to say, that there are different methods of carrying on the work in which the Board of Agriculture is engaged. This work takes on different forms in different States and in different countries, but always with the object in view of promoting the interests of agriculture. Divided as these interests are, into small estates, it becomes necessary from this fact to promote progress through co-operative work.

We find in England—a country to which we have looked with much interest for examples in the work—that agricultural societies do much of that work, through the offering of prizes for different interests. Farm improvements are encouraged by prizes. There, committees are sent out to investigate, study into, and enquire after the work of those competitors; and through their reports, carefully drawn up and recording every particular, the work of farm improvement is encouraged. Hence, from the examples there made, progress goes on. The dairying interests are encouraged by special schools supported by government, wherein instruction in this line of work is given in classes, in a manner similar to our common schools, offering prizes for proficiency in the work, in the handling of butter and cheese, and in every direction where progress is desired. This is carried on to considerable extent in the European countries.

Coming nearer home, we find in Massachusetts that similar work is there required of the agricultural societies, in order to entitle them to the bounties offered by the State. Unless they comply with the statute requirements, to hold public meetings for the purposes which we are assembled here to-day, they are not entitled to the bounty offered by the State. In the Western States, though agricultural societies are in operation, still this special work in which we are engaged is in many cases carried on by organized associations.

In Canada the Dairymen's Association employs expert teachers and lecturers to go around among the people and give lessons in dairy farming in all branches; going in among the people, assembling them together at the time when the work is going on, and giving them instruction in special lines of work, for the purpose of improving this interest, and the result has been such that the interest in that locality is being built up so rapidly as to put to shame the progress that any locality in the United States has ever made in the dairying interests; and as a consequence, at the present time, they are sending their product abroad to European markets, where it is taking the lead. It has outstripped the prominence that New York formerly held, and has displaced them in the market.

Going into the State of Wisconsin, where the dairy interests and agricultural interests generally have made more rapid progress than in any other State in the Union, we find that the Wisconsin Dairymen's Association has for several years employed an expert dairyman, on a liberal salary, and sent him out among butter and cheese associations for special instruction in this line of work.

The last Legislature of that State provided for a Superintendent of Institutes for the State, for the special purpose of going out through the State and holding Farmers' Institutes among the people, similar to those held in this State. A sum of money is placed at his disposal for the purpose, that would seem princely, compared with what is spent in our State of Maine.

I have mentioned this in this connection as showing that other sections feel the same interest in this work that we do; so if we propose to keep up in agricultural progress, we must not sit down quietly at home and think the work will go on. If we do, we shall be outstripped more than we have already been. There is no reason why the State of Maine should not be as wide-awake as any other. Our young men go abroad and awaken interest in other localities, and let us at home awake to the necessity of keeping up this work of progress, that we may not be left behind.

Before proceeding farther, perhaps it may be well to state that we have no fully-defined programme for this meeting. The leading subject, as advertised for the occasion, is the dairying interest; and to set you right in this direction as to our position for this occasion, we wish to say, that because the Board of Agriculture laid out this special subject for the occasion, we would not have you draw the conclusion that we lose sight of the importance of other interests. Occasionally, there has been a misapprehension upon this point. Because we wish to give special encouragement in certain lines, the conclusion has been drawn that the Board has become a specialist, and forgets other important lines of work. From experience in the holding of farmers' meetings we have always found that it was best —and I think your good judgment will bear us out in that—never to undertake to do too much at once. It is better to select a proper subject or line of work and dwell somewhat exhaustively upon that, leaving out the consideration of other subjects. At other times we take up a different topic and pursue the same course with that. It is always superficial work if we try to do more than one thing at a time. It is much better to take up one subject and examine it critically, than to introduce many and give them a superficial examination.

While we have thus chosen this subject of dairying in this county, we do not overlook the importance of other branches. We are here to-day to encourage this interest; another time, some other subject shall receive special attention.

SHALL DAIRYING BE ENCOURAGED IN PISCATAQUIS COUNTY?

By Z. A. GILBERT.

I do not undertake to introduce this subject because I want to, but I do it because I cannot at this time secure the service of those who are better qualified. In the first place let us lay aside formalities, as much as possible. We have come here for work, and we are ready to do it in any way you may will.

Through my own personal influence, the Board of Agriculture has been at work for several years in different places, for the encouragement of dairying among the farmers of the State. From my familiarity with the business (having been engaged in it ever since I have been carrying on farming), from my acquaintance with it in other sections of the State, and from my acquaintance with it in other States, I have felt that we were especially well situated to carry on this business in the State of Maine; that it was a business worthy of our encouragement, and one that would commend itself to the interests of farmers to an extent that would warrant them in enlarging the business among them. So thoroughly convinced have I been in these directions, that I have felt it right for the Board of Agriculture to use special efforts to extend the business among our farmers.

Wanting an expression of the other members of the Board upon this particular point,—whether these efforts should be continued or not,—a year ago, at the annual session of the Board at Augusta, the subject was brought before them at some length and was fully discussed, whether this interest as at present standing amongst us had proved of such advantage and so adapted to our situation that the Board of Agriculture should feel warranted in encouraging its further extension.

I felt that I, as its chief executive, wanted the indorsement of the members of the Board in the further prosecution of this work, After a full consideration and free discussion of every feature of it, and after looking over the success of the business in the State at large, the course taken by the Board was fully indorsed; and it was further recommended to continue this special line of work wherever it was desired by the people. So we are here to-day, not only with the encouragement of your local member and myself, but with the full indorsement of the full Board of Agriculture. With such backing as this, certainly we need not feel timid in pressing the attention of the people of Piscataquis County to this branch of farming. I suppose it is conceded everywhere in our State at the present time, that it is necessary for us to make stock husbandry, in some form, a strong feature of our farming. It can hardly be carried on without it successfully, any considerable length of time, anywhere. I doubt whether there is a man in Piscataquis County who supposes that he can successfully carry on farming operations on his premises with the use of purchased fertilizers alone. Fertilizers he must have to carry on his business properly; and if not made through the keeping of stock on the farm, then they must come through commercial sources.

Then stock is a necessity on the farm. If stock is a necessity, then comes another equally as important a question—What line of stock shall it be? There are many points to be considered in this connection. There are some men who are specially situated to do one class of work. If so, then that line of work is the work for them to pursue. All men are not alike, consequently there is a chance for choice. I think I could point out men who know or care but little about any other kind of stock except horses. Their special qualifications are in that line of work. A man who is specially constituted to handle horses cannot take any interest in other kinds of stock.

Just so with sheep. One man is specially interested in this kind of stock and cares little for any other. He likes to live with a flock of sheep. Such a man will make sheep husbandry a success. So whatever we recommend, it will always be with the understanding that there shall be adaptation to the business. To an individual, or to a community of individuals, who are willing to give special attention to the work, who are willing to give intelligent application to the work, there is no branch of stock husbandry that is found to pay as well in our State or in any section of New England as does this business of dairying. I believe, after deliberate consideration and careful examination of the field, that I am fully justified in making that statement. Of course there are men who have been engaged in it who haven't found it especially profitable. But you will find that those men have not given special attention to it, or they have not given to it that attention which is required for the successful prosecution of any business. Whatever a man's business is, I care not whether it is in the line of farming or any other line of business whatever, success is not met without close application to the business in hand. Dairying is no exception to other lines of business, and we say that in order to secure satisfactory results from the business, it must be pursued with close attention, with intelligent application to all its details, and especially holding in view the application of business principles which are necessary to farming as well as any kind of business. This is no disparagement to dairying —it is no argument against it. If a man seeks success, he must expect to make a corresponding application. And why not give a close application to business? The close application of a man's mental powers to business does him no harm; it strengthens him, tones him up, makes him more of a man in every sense of the word. It developes him as a man and a citizen to give this intelligent and close application to his business.

True, I have known a co-operative dairying enterprise to break down from the reason that farmers did not want to get up early in the morning to milk. If a farmer is too lazy to do that he does not deserve success, and will never find it in any direction whatever. A man has to be up and at it in order to accomplish anything. So dairying is no exception to other lines of work.

In the matter of profits we have sometimes arrays of surprising figures given to us when talking about special profits of stock and about the weekly or monthly yield of cows under a test. Of course they cannot be disputed; yet they have no bearing whatever on every-day affairs. It may be that a Mary Ann of St. Lambert may make a surprising amount of butter in a week, but it is not expected that a whole herd will do it. Such a test is not an illustration of what a whole herd may be expected to yield.

I speak of this business now, as what may be reached in a general way by a community of farmers. We have examples of what is being done in these directions, and we know that others may go to work and reach like results. It is not necessary to bring in surprising figures to prove the profits of dairying to any assembly of farmers anywhere.

I never wish to recommend dairying, nor has the Board of Agriculture ever recommended it to the attention of farmers on the argument of fancy prices for profit. Those fancy prices which a few individuals have obtained by special efforts of their own have given them returns over and above what farmers may reasonably expect.

There may be individual farmers who may secure special prices which may give them special advantages, but we never wish to talk about those things. We prefer to talk about what a community of farmers may reasonably expect to do.

There is a profit in dairying without these great prices. It is not necessary for a community of farmers to go out and purchase expensive stock in order to make this business profitable. The better the stock the more profitable, of course; but common stock will bring fair returns. I present the record for three years of a common herd as an illustration of what can easily be done when one makes it a special business.

1881—Average number of cows kept, eighteen.

Number pounds of butter made, 3600.

Average pounds per cow, 200.

Received for butter, 26 6-10c per pound	$961 17
" calves and hogs	119 38

Account of premiums at fair not kept.

Average receipts per cow, $60.03

1882—Number of cows kept, eighteen.

Number pounds of butter made, 3408.

Average pounds per cow, 197¾.

Received for butter, 25½c per pound	$908 62
" calves	128 60
" pork and pigs	104 65
" premiums	49 00

Average receipts per cow, $65.23.

1883—Average number of cows kept, nineteen.

Number pounds of butter made, 3675.

Average pounds per cow, 193½.

Received for butter, 24½c per pound	$891 44
" pork and pigs	109 61
" calves	154 00
" in premiums at fairs	92 00
Whole amount received	$1,247 05

Average receipts per cow, $65.58.

Mrs. M. L. Robbins has furnished me with a record of the performance of her herd of six Maine State Register Jersey cows for three years. This is an example of what a herd of good cows, well cared for, can do. In 1883, the six cows produced 2,058 pounds of butter, which sold for an average price of 30 cents a pound. In 1884, the same cows produced 1,711 pounds which averaged 32½ cents a pound. In 1885 the credit from the cows is made up as follows:

By 1858 lbs. butter, 27 2-3 cts. av. per lb	$514 00
" butter milk	20 00
" skimmed milk fed to swine, and calves dropped in 1884,	60 00
" 3 calves sold	41 00
" 2 calves raised	70 00
" dressing	60 00
	$755 00

I have introduced these as illustrations of what one may reasonably expect; and as entirely within the reach of those individuals who make the effort. If these individuals felt encouraged to go on why should not a community of individuals? I think you will find that in other lines of work, with accurate records kept, that, ordinarily speaking, you would find receipts from the farm less than is indicated in these records which I have given to you.

Question. You have given us the gross receipts; can you tell us the net profits of the cows?

Answer. No. What do we understand by net profits? I opine that it is a pretty difficult thing for any gentleman to tell exactly what the cost of keeping a cow or horse on the farm is. What does it cost to grow the feed that you give your animals? Many people in figuring upon these matters make gross mistakes in their mathematics. I have seen a great many pages of figures on the comparative profits of feeding ensilage and hay to stock; and in every case the individual has reckoned ensilage at its *cost* on the farm; while he always reckons hay at the *market value*. That is no comparison at all. It is easy to figure the cost of keeping a cow if you will take the market value of the products fed out to it. The hay does not cost you the market value, however, and possibly the same may be said of the other feed which is produced on the farm. We know what the feed is worth; but what does it cost?

Of course we want to figure as near as we can the costs, as well as receipts; but we must bear in mind all the while, that it is a necessity for us to work up our products on the farm. We are anchored there; *we are obliged to keep stock.* Now, that stock that will bring us the largest income from the products fed out on the farm, with a given amount of labor, is the stock to keep. And with due deference to other lines of work, I do firmly believe that the dairying interests will bring the largest returns.

I introduce these records to show what may be done with only common work, common receipts, common prices. If you will take the trouble, you will find in the Agricultural Report for 1882 figures recorded of the results of several of the Oxford County dairymen, and while there are no fancy figures placed there, you will see that the returns were quite satisfactory.

I do not talk about *possibilities*, I only talk about reasonable expectations in these operations. If these premises are correct, then why should not a community of farmers give special attention to this line of work? If one individual finds it profitable, then two or more or *all* who give it like attention can find it equally profitable. The more of one branch of business there is done in a community, the better the prices received for the product of that community, and the more effort will be made on the part of purchasers to secure their special product. You will see this illustrated in every direction.

Sometimes the idea is entertained that if the business is greatly enlarged we are going to overdo it; but it seems as if that argument has been proved false long enough, so it need not come up to intimidate any one in this direction. We have seasons of low prices; we are now passing through such a season. Low prices prevail in almost everything.

As a matter of fact, general dairying is finding better encouragement now in the State of Maine than it is in any State outside of New England. There is no State this side of the Rocky Mountains where the cheese product has sold so high as in the State of Maine this year. And so it has been in years past, and still our farmers think they cannot afford to make cheese, and want to go out of the business. In New York, where an entire section is devoted to this one interest of cheese making, the price for the six months' make this summer has averaged, beside the making, only six and one-half cents a pound. There have been but few pounds in this State sold for less than ten cents. Probably the entire product has averaged very nearly, if not quite that.

Our young men leave the State of Maine and our farms and go to the West—to Wisconsin and Iowa—to there go into the business of farming, under the impression that by so doing they will better their condition; and yet the prevailing price this season, in Iowa and Wisconsin, has been ten cents for the cream to make a pound of butter. Some of our farmers feel discouraged because they don't get twenty-five cents, and because in a few cases it has run below twenty. Still, out there they are willing to develop the business to an extent unheard of in the State of Maine. We ought to see in this something of an encouragement to push the business here. You will bear in mind that Boston and New York are great dairy markets for those Western States. We are nearer the Boston market than those States, and can take the lead in that market so long, and whenever we furnish a sufficient supply to attract attention. That locality that reaches the market first can take possession of the trade as long as they can furnish material to do it with. All we have to do is to do what they are doing there—and we can take the lead. It is going to be a long time before the State of Maine will make butter enough to make much impression on the Boston butter market. Some of those firms manufacture two and three thousand pounds per day and ship it by the car-load into Boston. We need have no fears but that the more butter we can make in the State of Maine the better our market will be. We need not hesitate on that score at all. There is room enough for all we can do, and facilities for transportation just in proportion to what we furnish for those facilities.

DISCUSSION.

E. B. Averill, Dover.

I can tell you one thing, and perhaps only one, and that is, I have always kept one very good cow. I have always made a pet of my cow. She always gave good milk and my wife managed to make very good butter and a tolerably satisfactory quantity. I have found practically that the better I fed the cow the better she responded in the way of milk and butter, and I am satisfied that all cows will do a like thing if they are treated aright. There is a vast difference between a scrubby animal and a nice, sleek-looking cow. One kept in that way will repay vastly better than if stinted.

They are a good deal like many other things in life. The earth, even, cannot be cheated; the Almighty has so made it that it will pay what it ought to pay and nothing more; what is actually due from the effort a man makes to till the ground. So in keeping stock —in keeping a cow, or horse or pig, I believe in making pets of them all. My cow, when I go into the pasture, will follow me all around for me to pet her and talk to her. I believe animals grow more and more intelligent as they are associated more closely with human beings.

I feel an interest in the dairying business. I don't think I could carry out the duties with a herd of cows if I had them, but I believe in the business of dairying most fully from observation. I believe in attending to the particular calling to which a man is fitted. It is for the reason that I feel an interest in other people who can carry out their plans in this direction, that I am here to-day and glad to help as far as my individual efforts may do, to make a success of a gathering of this kind.

E. B. Beals, Foxcroft.

I am satisfied from what little experience I have had in butter making that it is a very good business for farmers to undertake. I have had very good success in dairying. It has been my principal business. I have a small farm, and keep at present six cows. For the last season I have furnished cream for the butter factory at Foxcroft. Our factory here commenced work the 18th of May. I have figured up the amount of cream, and the amount of butter made up to the 6th of October, that I had furnished, together with what I had used in my own family, and it amounted to nine hundred and thirty-six pounds of butter—allowing two inches of cream for a pound of butter. These cows had nothing except what they got in the pasture. I had not fed them at the barn up to that time. I am satisfied that the farmers of this county ought to take hold of this enterprise, for I think it is the most profitable work that farmers can engage in. I think we can increase the products of the farm more by dairying than by any other work we can pursue. I think, further, that this associated dairying is the way to make butter, although thus far we have had hard luck. However, I think we have seen the worst of it, and am satisfied that when farmers take hold of it in earnest it can be made a success. It takes the labor from the house in a great measure; it makes a great deal better article. It is just as Mr. Gilbert said in his lecture, large quantities sell better than small ones, therefore I think it will be for the interest of all to engage in this associated dairying.

Mr. Hart of Willimantic.

I haven't had a large experience in dairying, but I will tell what I have had.

A year ago last December we commenced to weigh our butter from six cows. During the year, from the first of December up to a year from that time, we made one thousand and one pounds of butter and five hundred pounds of cheese from the six cows; one full-blood Jersey, one grade Jersey and Hereford, and the rest about half-blood Devons. From that time up to the first of last April we didn't keep an accurate account. From the first of April to a week ago, seven months, with six cows, we have made one thousand and fifty pounds of butter. Last season I got cans made at a tin shop in Monson, and took two hogsheads and sawed one in two and put one inside of the other and made a chamber between them, then set the cans in, filling around them with water, keeping ice in it. It made much less work for my wife and more for the men. We had to take the cans out of the top and dip the cream off. I would like to know if we have made an average lot of butter from the same number of cows with others.

I think, as far as my experience is concerned for the two years last past, that dairying is profitable. It is a good deal of work, a good deal of care, but I think the results from it have been better on my farm than from any other stock.

I think cows must be fed. In this past summer I have not fed until within two or three weeks, when I gave them beet tops, because I raise quantities of these. If we want to make good butter we have got to have a fair lot of cows, and they have got to be fed. The better the feed the better the quality of butter. My cows have a good chance for water; it is good enough for a person to drink, being from a living spring. Three years ago this winter I fed five cows five months with meal, and kept debt and credit. I fed coarse feed most of the time, except the meal, second quality of hay and some straw. My farm is part intervale, and I have some swale grass between high and low land. I kept debt and credit, and my cows paid me fifteen dollars over and above what I paid out, besides the skim-milk and dressing. I didn't reckon the hay more than $6 a ton that winter, and it did not cost more than that.

These cows averaged me $60 to a cow. The butter sold for twenty-five cents a pound for a part, and some of it sold for thirty cents.

MRS. C. J. HERRING.

I have been thinking how much alike all these gentlemen talk; no one finds fault with the business. It agrees with our experience, although this has been on a very limited scale. I can say with the rest that I think it is the most profitable branch of farming we can carry on in this section. I am not sure but it is better for the farmers and their wives, as men and women, for I think it begets more thought than any other branch of farming. I know it requires a great deal of care in all its details, if one goes into it in the right way. Many of the statements I have heard to-day agree with my experience, which is a matter of encouragement to me. I also hope to profit by the statements which are new to me to-day.

Mr. L. K. Litchfield of Winthrop.

Mr. Chairman, Ladies and Gentlemen: The subject of associated dairying is one that has deeply interested me for several years; and as I go through the country and notice in regard to this matter of dairying, I find that the people are interested. Also, wherever associated dairying has been tried for any length of time, so far as my knowledge extends, it has proved entirely satisfactory to the patrons of the enterprise. In discussing the matter of associated dairying, we do not leave out altogether the matter of private dairying. There are very many farmers engaged in private dairying who are carrying it forward successfully. In associated dairying, at the start, there are very many obstacles to encounter; a great deal of prejudice to overcome, and much to learn, the object being to produce a uniform article of a very high quality. In associated dairying this should never be lost sight of. I learn that you here have encountered obstacles, but time will work out for you a satisfactory result. It was new to you, as it was to those who commenced that business in other places; and much has to be learned. But as we go on and observe and study we learn the way more clearly and learn the why and the wherefore. Yours has been the experience of almost every creamery started in the State of Maine; but as they go on, they have developed into a degree of success that is satisfactory.

In comparing the results of associated dairying with those of private dairying, we get a better view of the subject perhaps than in any other way. When we look upon the two systems, as has been intimated here this afternoon, we find that only a very few out of the whole concerned in private dairying through the State are really successful. Private dairying gives to the farmer who conducts it on business principles, and to that extent which some of you are doing, liberal returns. But the whole number of dairy farmers, taking them together, are not realizing so much. Now when they collect the whole together, under the associated system, we find that the product is of the same character, while before every one made a different style of butter, and found a different market at different prices and with scarcely two alike. Mr. Hart sells in Monson. All the farmers in Monson cannot obtain that price and that market. Some of their butter has to go to other markets, and they receive perhaps a smaller price. The same is true with dairy butter which does not go to the same market. How is it with that made under the associated system? As was said by our Secretary this morning, the larger the quantity the better market and the quicker sales. We have found that to be the case with regard to butter. Where we have made three or four hundred pounds a day, of a uniform article and of high quality, there was no lack of a market. I think that if all the farmers of Maine could be associated in dairy work, the market would be alike, and there would be no difficulty in disposing of the product at a remunerative price. It is only when butter of a poor quality is offered that the price goes down. I was shown an article here that would in quantity receive the attention of buyers anywhere, and would be called for and find a ready market at a large price. If this is the case, what is the obvious view to be taken? It is that we should associate together as manufacturers of butter and find a place for that product. I believe that the system of associated dairying is to develop largely in the State of Maine, and from my personal observation and from what I can learn, I can see no reason why it should not. I have no doubt that in the future this is to be the business in which the majority of Maine farmers will be engaged.

I see no reason for discouragement; I see no reason why we should look back upon these slight failures which we made at the beginning, and say there is no success in dairying. I believe the future is full of promise to the farmers of Maine.

Farmers who undertake dairying, I am free to say, ought to make it a specialty in a large sense. There are but few of us who are able to control the various industries now carried on upon the farm successfully and make paying results. There are hardly any of the farmers of the State of Maine who can take up several different branches of stock-raising and carry them on successfully upon our small farms. Specialties are being developed to a large extent, some raising horses, others oxen, others carrying on dairying, and some largely engaged in sheep. So, I believe that special effort in one direction gives us better results, and we are better able to carry the business through successfully than if we were engaged in different lines of farming.

The idea of over-production of good dairy products has been talked of. There are those everywhere who believe, and perhaps sincerely, that it is possible to overdo this business of associated dairying. I am one of those who apprehend no difficulty in that direction. If we make a poor product we will very soon find out it is not wanted. The great object is to make the very first class product, to put it upon the market in the shape people want it. We are approaching very rapidly a point in this line of work when nothing but first-class creamery butter will be in demand at remunerative prices. Indeed, I believe that at the present time it leads in many of the fashionable hotels of Maine; and in many of the private families creamery butter is demanded. As a rule, a better quality of butter is made in the creamery than in private dairies, though some of the private dairies make excellent butter.

Question. Is our northern creamery butter equal to the western?

Answer. There is some of the western creamery butter that sells higher than the northern creamery, but I think it is from the fact that our product is not well known and that we are putting so little on the market. They began sooner and are making more. I see no reason why the State of Maine, with its green pastures and excellent cows, cannot compete with the West.

Question. Do you think we can successfully compete with the West in making butter, and pay seventy-five cents a bushel for corn when they procure it for fifteen cents? And feed our cows nine months in the year, when in the West they only feed three?

Answer. I believe that aside from grain feed, other feeds are as cheap here as in the West. By keeping a dairy and retaining all the fertilizing elements upon the farm, we may raise our own feed and be independent of the West. We needn't go there and buy corn at seventy-five cents.

Question. You were speaking of creamery butter. Can you make a lot of butter to-day, and to-morrow another lot, so that no one can distinguish the difference in the quality?

Answer. The quality can be made very uniform from day to day.

Question. Don't you have certain regulations with regard to feeding the cows?

Answer. Yes, we prohibit cotton seed meal. During the last year not a pound has been used in Winthrop to my knowledge. It affected our product. We must make what the *market* wants, not what you or I esteem the best article. Just what the market wants is good, nice butter, newly made, and the newer the better.

Question. Is there any objection to putting night's and morning's milk into the can together for butter making?

Answer. Yes, it disturbs the cream. It would not do for me to put the night and morning milk together when another man does not. Besides, it does not make as good a product. We are under obligations to the proprietor of our factory to make our cream under the same conditions.

Some one asked what I consider a good cow. Different farmers have somewhat different ideas in regard to what is a good cow. A good cow is one that will make from two to three hundred pounds of butter a year. I am leaving out the matter of stock raising. I am pleased to say that there are a good many cows that will make two hundred and fifty or three hundred pounds a year. When a dairyman finds that he has one that makes less than that, his object should be to improve that cow, or displace her by a better one.

Question. Would creamery butter with the same amount of salt keep as long as any other?

Answer. We don't keep creamery butter; it is sold within a week after it is made. We tried the experiment of keeping warm weather butter, but it wasn't successful. Formerly we sent to a commission house in Boston; to-day it is being used in hotels and private families in our own vicinity. The patrons of butter factories go to the factory for butter. It is a better article, as a rule, than is made at home. They get it fresh and only a small amount at a time.

Question. I would like to know how many pounds of milk it takes to make an inch of cream?

Answer. I don't think any one can tell you that, for it is not a uniform quantity. It depends upon the quality of the milk. A can holds thirty-five pounds of milk, when within half an inch of the top. Herds will vary from five inches of cream upon that can down to three, so it is very difficult to tell how much milk it takes to make a pound of butter. We haven't been troubled about that in our vicinity, because we care but little about it. Last March an arrangement was made with the association, whereby the butter factory was rented to a firm. The firm has been running it since, giving the patrons a stipulated price for cream.

Question. Those who produce milk would like to ascertain which is most profitable, to carry it to the butter factory or cheese factory?

Answer. I can tell you how I am best satisfied; and that is by continually producing cream for the butter factory. It satisfies me better than the cheese factory. In the production of butter we send away the cream only and retain the skimmed milk for feeding purposes on the farm. For myself, in maintaining the fertility of my farm and furnishing me with the means of a livelihood, I think that butter making is decidedly better than cheese making.

I can see no reason why Piscataquis County and the town of Foxcroft cannot make as good butter as they can in Winthrop, when they have the same kind of cows.

EVENING.

PLANT FOOD.

By PROF. W. H. JORDAN, Director of Experiment Station.

I want to express my pleasure at being present at this Farmers' Institute. Five or six years ago, when the Board of Agriculture was organized under a new plan, I was, by law, a member of it, and tried to help the Secretary "stump the State." I have retained, during my five years' absence from the State, a very strong interest in the work of the Institutes, and it gives me pleasure to be here again at a meeting for the furtherance of this work.

In this matter of the fertility of the soil as connected with dairy farming, I shall say only enough to draw out questions. I find that in saying anything, I must talk differently from what I did six years ago. Facts concerning fertilizers and foods that were coming into prominence at that time, being part of the missionary work of the Board of Agriculture, are familiar facts to-day. You all stand upon a different plane from what you did six years ago; there has been progress in the standard of work during that time. It is possible, that in this matter of fertility, I shall go into the A B C's, and that you will all look upon what I may say as very familiar facts; but it is sometimes good for us to find out if we are familiar with all the letters. You well know that plants have to grow out of something. They grow out of certain definite things. You cannot build a plant to-day out of one thing and to-morrow out of something else. There is no variation of the kind. Plants get their material out of the soil and from the air. The prime consideration for farmers is the matter of fertility. If our soils are fertile enough to grow the crops we want them to, we farm successfully. The great problem of agriculture is the maintenance of fertility. You may talk about grain and grass raising,—the thing behind every agricultural operation is fertility; that lies behind every other question as the prime consideration.

The question of where to get an artificial supply of food for plants is of the greatest importance to us. Plants must have certain things to grow from. You know the materials for which we are paying money to-day are nitrogen, phosphoric acid and potash. These are the three ingredients our soils are likely to need, more than others. There are fertilizers sold in the State for $40 or $45 a ton. What you pay for are those three ingredients. Our cattle foods contain those ingredients, because cattle foods contain what is taken from the soil. They take from the soil the percentage of those ingredients which we apply in manure, and which give value to manure.

First of all, supposing cattle foods do contain such ingredients, does the manure of the cattle contain the same? How much does that food lose value? There has been a great deal of work done in order to find a correct answer to these questions, and this is about the way the matter stands.

A full grown animal, not producing anything, returns to the manure heap nearly the whole amount of the manurial ingredients that the food contained. That is not quite true of the nitrogenous material. Growing animals take something out, but only a small percentage of the manurial ingredients that are in the food. If you purchase manurial ingredients in the shape of commercial fertilizers, of the kind and in the quantity found in a ton of cotton seed meal, and pay the prices you have to pay for fertilizers, the cost would be considerably over $20 a ton. In the case of corn meal the cost would be a little over $6 a ton for its nitrogen, phosphoric acid and potash. If a man had to buy them, there would be that difference. I think these are practical facts, and it seems to me there is something for the farmer to consider, in the purchase of cattle foods, of what he is going to put into his soil. It is a point of great value.

In Pennsylvania, we have been in the habit of buying cotton seed at $26 a ton. We found, in fattening steers, that cotton seed meal was fully as economical as corn meal, when it was mixed with corn meal. We know, as far as any theory can be substantiated, that the manurial residue was worth several times as much as that of corn meal. So, if cotton seed meal can be used as feed, I believe it is profitable to buy it for its manurial value.

OXFORD COUNTY.

Institute at Denmark.

The Oxford County Institute was held at Denmark, November 3, by invitation of the West Oxford Agricultural Society. The members of the Board met a cordial reception, and were tendered a generous hospitality by the citizens of the town. The attendance was not large. A. O. Pike, Esq., the local member, conducted the exercises. "Composition and Valuation of Fertilizers," and "Shall Young Men Follow the Farm?" were the leading subjects. No report is given.

FRANKLIN COUNTY.

Institute at Kingfield.

The Institute in Franklin County was held at Kingfield, December 24, at Winter Hall. On account of the remote location of this town, the attendance was chiefly drawn from a limited area, and did not fully represent the county at large. There was a goodly interest manifested and a large attendance throughout the day and evening. The meeting was called to order by the local member, J. W. Butterfield, and Mr. Samuel Stanley was called to preside.

ANTI-EMIGRATION—A PLEA FOR MAINE.

By J. W. BUTTERFIELD, Member of the Board for Franklin County.

Ladies and Gentlemen of the Institute:

When, nearly half a century ago, the so-called "Sage of Chappaqua," the talented but eccentric Horace Greeley, uttered that now historic saying, "Go West, young man, go West, and grow up with the country," he probably little dreamed of the changed conditions confronting the New Englander, and especially the Maine man, who might think of leaving his native hills in search of wealth or fame in the far West or "Sunny South" at the present day. Then, the upper Mississippi Valley, now known as the great Northwest, was nearly all open for settlement, and prairie land sufficient in extent to found an empire and as fertile as the sun ever shone upon could be had for actual settlers at trifling expense. In those palmy, prosperous days of the new Northwest the rush of emigrants thereto was indeed marvelous, so much so that Whittier aptly describes the scene in verse, when he says:

> "I hear the tread of pioneers,
> Of nations yet to be;
> The first low wash of waves, where soon
> Shall roll a human sea."

Such, in brief, was the condition of things on the public domain forty years ago in the great West, and many were the fortunate emigrants who improved that golden opportunity for occupying those fertile public lands as permanent homesteads for themselves and families. During the period of which we speak, railroads in the prairie sections of the West were unknown; but now the situation is greatly changed. Railways penetrate and interlace nearly every nook and corner of the desirable and fertile settling lands of the public domain, and nearly every section within railroad limits, or adjacent thereto, has long since been occupied by actual settlers or bought up by avaricious land speculators and wily railway corporations, whose extortionate prices for the same place all these valuable lands practically beyond the reach of the poor emigrant desiring to establish a home upon some valuable section of prairie land in the great West and within reasonable distance of railway communication.

The emigrant of to-day who goes West or Northwest in search of a homestead on which to found a home must expect to journey far back to the very borders of civilization, perhaps far away from railroads or even neighbors, if he expects to find lands of like fertility and value as those which formerly tempted the emigrant to locate in the now densely populated regions of the West. A gentleman from Nebraska, while visiting Maine the past summer (1885), stated to the writer that a new railroad had recently been built from a point connecting with the Union Pacific R. R., west of Omaha, Nebraska, up the valley of the Elkhorn River, in a northwesterly direction, the terminus being on the Niobrara River, in the northwestern part of the State, and which was supposed to open up a large tract of agricultural lands for actual settlers. Almost as soon as the last rail was laid, an emigrant, desiring a homestead, wrote, in advance of his coming, to a friend, requesting that his name be entered at the Land Office for a quarter section near the line of the railroad, and that he would be there in a few days to perfect the preliminary title and to occupy and improve his future home. To his great disappointment and chagrin word was immediately sent back that not a single acre of public land could be secured under the provisions of the "Homestead Act," within thirty miles of the track, on either side of this newly-constructed railway. Such is the greed of railroad corporations and land speculators that frequently when a new line of railway is to be constructed through the public domain in the West, these over-reaching corporations and wily land speculators, who happen to be initiated into the mysteries of the railroad ring, have secured in advance of track-laying every single section of valuable or available public land within railroad limits on either side of the line, so that the poor emigrant who comes later, seeking a homestead, must locate his home remote from railroads, remote from schools and churches, and far away from all those civilizing influences which go to make life desirable, or even endurable, in the prairie regions of the far West.

Years ago, before the advent of railroads and telegraphs in the West and Northwest, when "distance lent enchantment to the view," much was said and written by designing and interested parties in regard to the reputed mild and salubrious climate of the then new prairie sections of the Northern Mississippi Valley, where little snow was ever known, where stock of all kinds would winter comfortably and well without shelter, in the open fields, with perhaps a few cornstalks or straw-stacks to feed upon, if there should happen to come a snow-storm, which was not probable in that mild clime. Many were the emigrants from Maine who were lured away from comfortable homes by the siren songs of interested parties to try the realities of a prairie life, but many of whom, having returned to their native hills and vales, now relate with a shudder that their frightful sufferings while facing "Western blizzards," with the thermometer forty or fifty degrees below zero, have long since completely cured them of the romantic theory of a mild and genial winter climate on the great prairies beyond the Mississippi. Reference may and should be made here to the frightful frequency in recent years of those terrible cyclones and tornadoes which sweep our western plains, dealing death and destruction to the unfortunate city, town or hamlet which happens to be located within the pathway of the merciless tempest. A lady emigrant from Franklin County some four or five years ago settled in the West near a village which had but recently been nearly destroyed by a cyclone, because she had relatives living near where her new home was located; but soon a letter was received by friends in this county, saying that she had determined to sell out and quit that part of the country, stating as one of her chief reasons for leaving, that her children upon the first appearance of a cloud in the sky, or the slightest puff of wind, would run to the cellar for protection, and she furthermore declared that the family left without regrets, believing in the common-sense theory that people might just as well die any other way as to be scared to death. So much for the cyclones and tornadoes of the West. An all-wise Providence has given the fortunate people of Maine her everlasting hills and mountains, coupled with dense forests of timber, to modify, break up and destroy the power for harm of those terrible wind-storms which sweep the prairie sections of the West with such destructive power. The thunderbolt may startle, and the vivid electric flash may cause momentary alarm and fear, but the roar and crash of a real genuine Western cyclone when under full headway is said to be, of all earthly scenes, one of the most terrific and appalling.

Another serious objection, especially for the Maine man, to settling on the great plains of the West is the inadequate supply of pure and palatable water for domestic purposes, which here in Maine flows from every hillside and through every valley, without money and without price, in unlimited quantities, pure, sparkling and free as the air we breathe.

Still another and not less serious drawback which confronts the far western pioneer, in an agricultural point of view, is the periodical droughts, long continued and severe, that have blasted the hopes and crippled the means of many an energetic and expectant pioneer farmer in the newly settled portions of the far West. It is an old adage that "troubles seldom come single handed," and these droughts are frequently accompanied by countless hordes of voracious grasshoppers, which swoop down from their breeding places in the foot-hills of the Rocky Mountains, devouring every green thing in their pathway, and ruining in a single day the entire crop of many an expectant and confiding farmer. To offset some of the advantages claimed for the great and growing West and "Sunny South," which I certainly would not underestimate nor undervalue, may be mentioned the fact that nearly the whole section designated as the western and southern portion of the Republic is infested to a greater or less extent by poisonous reptiles and insects, which have always been the terror of the inhabitants in all countries, under similar circumstances, in all ages of the world. Here in Maine, on the contrary, we can lie down at night and sleep soundly with the comforting assurance that hitherto no poisonous reptile or insect has found permanent lodgment within her borders. Here in Maine, also, her people reap the full benefits of living in a clime where fever-and-ague, that scourge of the West and South, is practically unknown.

It may not be amiss here to speak of the "Florida mania," so called, which in recent years, encouraged by deceptive and inflated puffs of interested land speculators, has induced many hard-working and prosperous Maine farmers to abandon a thriving business here to seek sudden wealth in that "land of flowers," where it was said oranges and early garden vegetables could be raised in profusion, and at little cost to the producer, and the pathway to fortune and opulence was easy and certain. Their sure and large surplus products, as these wily speculators represented, could be placed in the great eastern markets of New York, Brooklyn and Boston in advance of similar products from any other section of the country. A gentleman from Franklin County recently spent a winter in Florida, and while there visited nearly every portion of the State in search of a desirable location for an investment in real estate, and finally concluded to invest only a small sum in a small lot in a small town, just started, in the central portion of the State, and then returned to Maine to await further developments in regard to a place that the Southerners and land speculators termed an embryo city of great promise. After the lapse of nearly a year, the gentleman wrote to the so-called "mayor of the city," inquiring as to its future prospects. Word was immediately returned that Florida, as a winter resort for invalids, was in some instances beneficial; also, that in favorable locations, in favorable seasons, orange orchards were profitable, but the "early garden vegetable" business and all other agricultural pursuits, on high pine-land ridges, the only healthy locations for northern people in that malarious clime, should be discarded as an ignominious failure.

We have seen a specimen of Florida soil, taken from one of those healthy locations so frequently spoken of by newspaper correspondents, and on which Maine emigrants are urged to settle and in which they are asked to invest their money in anticipation of founding a permanent home. This specimen soil which we saw very much resembles white sand taken from the sea-shore and mixed with a little more sand from some river's beach, and to all appearance is utterly devoid of any fertilizing material whatsoever. There are richer agricultural lands in Florida than those mentioned, called lowlands or bottom-lands, but such locations are so subject to malaria that no Maine man would ever dare risk a permanent settlement thereon. These gilt-edged Florida schemes are generally conceived in sin, born in iniquity, and vomited forth upon an unsuspecting public through the medium of newspaper correspondents, richly paid by interested speculators in worthless southern white sand ridges. For further information upon this particular part of our subject all Franklin County people, infected with the "Florida fever," are respectfully referred to the excellent address delivered before the North Franklin Agricultural Society at Phillips, in the fall of 1885, by R. P. Thompson, Esq., of Jay, entitled, "A Maine Man in Florida." If any Maine people, after hearing Mr. Thompson's address and examining his specimens of Florida soil, are still infatuated by the so-called Florida boom, let all such depart in peace, for their case is past cure.

One of the first drawbacks which confront the emigrant who settles upon a western prairie, especially if he goes from Maine, is the utter absence of forests. Generally in those regions not a stick of wood for fuel, nor a foot of lumber for fencing or building purposes can be obtained except for cash, at the railway stations, and then, in many instances, at exorbitant prices, while here in Maine the grand old "forests primeval" still cover the whole northern portion of the State, and every farm and hamlet is plentifully supplied with wood and lumber, the moneyed value of which can scarcely be over-estimated.

Such, in brief, are some of the objections to emigration south or west. The question, then, that naturally presents itself may be stated briefly: Do the inducements to settle and remain in Maine over-balance the inducements to emigrate, coupled as they must be with all the drawbacks heretofore mentioned? Maine has an area of good agricultural lands, and also a sea frontage greater in extent than all the rest of the New England States combined. Her shore line is indented with numerous navigable bays and harbors. Among the latter may be reckoned some of the best in the world, and dotted in front with numerous clusters of sea islands, many of which are sprinkled with summer cottages, and are fast coming into repute as fashionable places of summer resort for the wealth and *literati* of the land.

Her shipping and fishing interests—both extensive and profitable —her quarries of slate, lime and granite, as yet but partially developed—her extensive water powers in connection with her great, growing and exceedingly profitable manufacturing industries—her lumbering interests, vast and apparently inexhaustible, containing inherent and undeveloped sources of wealth, the future value of which it is impossible to estimate. Interwoven with, and overshadowing all other State industries combined, are her vast agricultural resources and capabilities, especially in Aroostook County and what is now generally known as the far-famed Aroostook Valley. Here is an area of unrivalled settling land, plentifully supplied with valuable timber, and greater in extent than some of the smaller States of the Union, to be had for merely nominal prices, and whose proximity to the great eastern markets of the country, by the recent opening of railways, places a value upon the surplus products of the Aroostook, and all other Maine farmers, far in advance of prices obtained by producers in the far West or South, where profits are generally absorbed by greedy railroad corporations in exorbitant rates of transportation. Maine has long been noted for its fine and extensive apple orchards. Our winter fruit, for fine flavor and keeping qualities, is now taking the lead in fruit markets of the world. Our surplus hay, wool, potatoes, grain and lumber, all find a ready sale for cash at remunerative prices by reason of our proximity to the great eastern marts of the Union.

Last, but not least, may be mentioned Maine's summer resorts, and also her hunting and fishing grounds in the northern and western portion of the State, where annually congregate hundreds and thousands of votaries of the "rod and gun," plentifully supplied with cash, and all in eager pursuit of health, recreation or pleasure. In the summer season of the year the scene in and about the Rangeley Lake region is bustling and busy, and is aptly described by a tourist who said that the hotels were all full, the camps, lodges and association buildings were all full, and the woods were full of summer boarders and sportsmen. Here, in the clear, sparkling waters of our northern lakes, sport and revel and multiply in countless numbers the trout, the togue, the blue-back and the salmon. Here, also, in the highland regions of Northern Maine, is the realm of the moose, the deer, and the caribou. Gentlemen of the Institute, this pleasure-seeking throng has come to stay. Generations may come and go, but annually, in after years, these sportsmen and tourists will return to these lakes and mountains, bringing by their sojourn wealth and employment for hundreds of laborers, the very life and activity of all Northern and Western Maine.

Our seats of learning, our seminaries, and, withal, our free public schools and our churches, the pride and glory of the State, are not, perhaps, surpassed by like institutions in any State of the Union.

Forty years ago, when the western boom was at its height, we had no railroads this side of Portland; but now they penetrate and interlace nearly every section of the settled portions of the State, and soon the so-called "Megantic Railway," that grand international highway of commerce will span the northern portion of the State, crossing Franklin, Somerset, Piscataquis and Penobscot counties, thereby opening up vast sporting, lumbering and agricultural sections, the future financial value of which it would be impossible to foretell.

Reference may properly be made here to the last Bank Examiner's Report of the condition of the savings banks of the State of Maine for the year ending December 1, 1884, that unfailing barometer of the prosperity or adversity of the masses of the people of the State in a financial point of view. This report at that date showed deposits amounting to $32,913,835, also showing an increase of deposits during the preceding year of $1,541,966.29, or an average of $311 to each depositor and $50 per capita for every inhabitant of the State (and the aggregate deposits in savings banks in the six New England States amount to the vast sum of $300,000,000). These are surplus earnings of those generally considered the poorer classes, and represent only a very small percentage of the wealth and ready cash of these communities, but indicate a prosperity flattering and unmistakable. Official statistics also show the wealth of the New England States in the aggregate to be greater per capita than that of any other section of the Union, and Maine is no exception to the thrift of her wealthy and prosperous neighbors.

If, then, these few facts and figures, briefly stated, indicate a brilliant financial future for the "Pine Tree State," and map out inducements for remaining within her borders which over-balance the shadowy inducements for emigrating south or west then let us, as citizens of Maine, and as agriculturalists of Maine, be of good cheer and be content with our lot, believing that we can so conduct our affairs politically, agriculturally, religiously and morally, as to attract and hold within our borders a dense and wealthy population, bringing in its train, as it certainly will, all the elements of prosperity and power essential for a free, enlightened and progressive civilization.

MISTAKES OF FARMERS.

By S. L. HOLBROOK, Member from Sagadahoc.

By a law of the universe, it is so fixed that man makes but one pilgrimage through this world, and that journey is comparatively a very brief one, covering a period of but a few years. Then, as Shakespeare says, "he goes to that undiscovered country." In view of the brevity of this mortal pilgrimage we are admonished that if we would make our lives and our business successful we must make as few mistakes as possible. It has been said that experience teaches a dear school and that fools will learn at no other. Let us, then, brother farmers, act the part of wise men, and profit by the lessons of the past and the warnings of the wise, that we may steer clear of those sands and rocks upon which many a man has made a dreadful shipwreck.

It should be the end and aim of all men to be successful. I suppose that we all possess that aspiration, to a greater or less extent. When we come to shuffle off this mortal coil, to know that we have been successful in all our business relations, and in everything that goes to make up the great sum of human happiness, would, as Hamlet says, "be a consummation devoutly to be wished." Let us, then, briefly enumerate what we consider some of the mistakes of farmers. And, first, it is a mistake to think that the State of Maine is not a good place to live in—just as good a place, all things considered, as the sun ever shone upon. This feeling of unrest which characterizes the farmers of our State is the great bane of all permanent improvement, and fosters a want of permanence in all our work. The farmer who is all the time talking about selling his farm and going to some other place will never accomplish much, and will make but few improvements.

It is a mistake to locate or undertake to farm on a poor soil. We all very well know that there is a vast difference in the productive capacity of our New England soils. I would say to the young man, If you contemplate making farming your business, be very careful about selecting that piece of land whereon you think to plant yourself for life, for many a man has had to regret this unfortunate step when the shadow of life was too tall to rectify the mistake. You may take two men and put them both on farms, and they may be men of equal ability. Let one of them have a soil that is naturally productive; the other have a poor soil. The man with the good soil will pass the other as fast as the iron horse will pass the stage coach. My advice would be, let poor lands produce wood, but never attempt to farm on a naturally poor soil.

Among the many mistakes of farmers, the great and crowning error, pecuniarily, is that of buying so much grain, or in other words, "going out west to mill." Unfortunately, we have no figures to show the aggregate amount of grain brought into the State annually, or the amount of money paid out by our farmers for western grain. Suffice it to say, it is quite enough to make every farmer in the State of Maine blush for shame. It is a shame and a disgrace to us when we have thousands and thousands of acres of good land that is almost lying idle and which needs to feel the renovating effects of the ploughshare. While the grain crop is one of our surest crops, and with an average yield to the acre that is hardly surpassed anywhere in the country, yet every train that goes steaming along our great tramways is hauling grain to the farmers of Maine for which we are paying out money that ought to be kept at home.

But I think I hear some farmer say that we cannot afford to raise so much grain, that we can buy it cheaper than we can raise it. Well, then, why do you raise any, for most certainly if it will not pay to grow one, two or three hundred bushels, it will not pay to grow ten, for the more you grow the cheaper you can do it. If you have but one acre, you must have a team and you must have the same implements. The same outlay is required in that direction as if you cultivated more. You have got the farm, you have got the team, and you have got tools—everything to do with, and why not go and do it? Because we have got into a kind of an easy way of farming, and in the habit of buying our grain. The force of habit is strong, and has sent many a man to a premature grave. I am afraid that the habit of buying so much grain will send us farmers to a premature grave, financially.

If there is a small profit in keeping cows, hogs and hens, or raising steers, by buying grain to feed them, how much better it would pay to grow that grain on our own farms. It is not always the amount of business that a man does that makes him rich; rather it is how he does it; not the amount of money that he handles, but what he saves. By raising your own grain you are making more of a business of farming and extending your operations. You will be building up your farm, you will think more of yourself and home. You will command the respect of the community when they see that you are doing a business that is worthy of respect, and it will develop a spirit of enterprise in others and they will want to do likewise. This is a serious matter, and of vital importance to the farmers of Maine. It is a question that should be talked up by the Board of Agriculture, in the agricultural papers, in the Grange, and with no uncertain sound, until the farmers of Maine are awake to the importance of it.

Farmers will make a mistake if they do not learn to accommodate themselves to the surrounding circumstances. Benjamin Franklin wrote home from England in '76—he being there at the time of the passage of the Stamp Act and the Boston Port Bill—saying "the American people must now light the lamps of industry and economy." Farming as well as other business has its ups and downs, its hard times and its good times, its high prices and low prices. Just now there is a general depression in all branches of business. Farmers will be wise if they learn to accommodate themselves to the situation, and instead of going into the markets and buying grain raise it themselves.

System in the business of farming is a qualification that is highly commendable, and on it much of our success will depend. It is also something in which our farmers, as a class, are sadly deficient. In all other branches of business, the men that succeed are those that systematize their work. Slipshod farming has driven many a boy from the farm. The farmer should concentrate his energies, his thoughts and his capital upon the business in which he is engaged, and having begun in one line of battle resolve to fight it out on that line. Adopt every improvement; have the best of machinery; have some system in regard to the number of hours' work to be done on the farm each day; have a time to commence work in the morning, and when the good housewife, who has been at work all the forenoon in doing the general housework, rings the bell for dinner, answer the summons at once. Drop everything and go. Have some system in regard to ploughing or cultivating your fields. Do not go into the middle of a field and plough up a little patch, and spoil more land in getting to it than the crop you will raise from it will be worth, but commence on one side of your field and plough a long and straight furrow the whole length of the field; then you can work to some advantage and the work will look a little more like business, then you will know when you have gone over your field. You will know your latitude and longitude. Every farmer should adopt such business-like methods as would enable him to tell with precision what crops he would grow on certain land, or what crops should form his course of rotation, and not have such a conglomeration of ideas and practices. The loss to the farmers of our State, annually, by not having their work well planned, if it could be computed by figures, would amount to thousands.

I have thought that if there was a premium offered, and that premium should be awarded to that class of people that would find the most fault in a certain length of time, the farmers would bear off the palm every time. And here is another of our mistakes. For we not only make ourselves unhappy, but we make our society uncomfortable to those that we come in contact with. Go out into a farming community and you will hear such complaints as these: "This is the wettest time that ever I saw. It rains all the time." "Well, this is the dryest time there has been for twenty years, and everything will all dry up. We live right here under the ridge-pole and every one of the showers goes around and we don't get a drop." "It is too cold—it never was so cold before. There will be a frost and kill everything." "I shan't get a half crop of anything; and if it does grow I shan't get anything for it." "I have to work the hardest of anybody in town, and them fellows over there riding about." "I am taxed to death." "Farming is a poor business and if I could find anybody that would buy my farm, I would sell out at once and go somewhere else." Everything goes too fast or too slow, and it is growl out doors and find fault in the house. It would not seem to be unkind or unjust that for such unthankful hearts the Omnipotent should withhold his bounties. Farmers as well as all others should remember that we are but pensioners upon the bounties of an hour.

Farmers should stop and take an account of stock and see how they stand; look on both sides of the ledger, see how much they have received and how much has been paid out. And if they look aright they will see that a steady stream of favors has been flowing in to them all their days. The sun rises every morning in its accustomed place, the seasons come and go with regularity, and the earth has not withheld its increase.

There is no one thing, perhaps, that will so command the admiration of the passer-by as well-cultivated fields, fields that give promise of an abundant harvest. On the other hand, nothing that presents so homesick a look as neglected fields. They tell with unmistakable language the condition of their owner. Says the wise man, "I went by the field of the slothful, and lo, it was all grown over with thorns, and the stone wall thereof was broken down. Then I saw and considered it well. I looked upon it and received instruction." If he who was styled the wisest of men could learn from such examples, most certainly we have plenty of opportunities to do likewise. No doubt the owners of these fields referred to by Solomon took an active part in politics and talked up the rebellion of Jeroboam, and said that the country was misruled, and everybody that was in office was dishonest. We can learn many a useful lesson from well-cultivated fields.

It is a mistake in farmers not using the power that is within their reach—a power they might easily possess were it not for the petty jealousies which exist among themselves. Farmers have ten votes to seven of all other occupations. They have votes enough to carry any election. They can put ten farmers in Congress and in the State Legislature for every one they have now. They can make their own laws in all the States. They can combine into a compact body. They can co-operate, can stand by one another, and if they do, can rule the world. They also have the power whereby they can continue to be the drudges they have always been as a class—the prey of every cunning speculator in the land.

Some men who own farms and have an investment on them of from three to five thousand dollars think it will not pay to hire help. Here is a big mistake. The men that are making the most money by farming are those that are putting the most labor on to their farms. The farmer who is hired man and chore boy and everything else can have but little time to make improvements on his farm, and will drag along in a snail-like way. A man's hands were given him to work with, no doubt, the head and brains were furnished to guide the hands. With hands alone a man makes a bare subsistence. A dollar has been considered as the equivalent of one day's common, unskilled labor. Brain work has no limit to its value for it can direct unskilled labor. There is ample scope for brain work on the farm, and it is only by the use of it, and not by hard work alone, that we can hope to be successful in our farming operations.

It is a mistake to think that men of other professions get rich fast. The men that have accumulated a fortune in other pursuits rather than farming are the men that wear gray hairs to-day. If they have succeeded in life it has been the result of a close attention to business, a long and strong pull in one continuous line of effort for years. A broken-down constitution and a premature grave is often the price they pay for their success. Our young men leave the farm because they think they have to work so hard, and go to the city and work from five in the morning until nine at night in the store or mill. It is an error to think that farmers work harder than men of other pursuits. The student that gets an education has got to work hard. The lawyer that succeeds has got to be in his office early and late. Merchants must work fifteen hours a day, and the mechanic is tied to a bell-rope.

Some people who live in the country have got the idea that farmers do not have any privileges or any of the luxuries of life—that those who live in the city have them all. Let us see about that, and see if the farm does not afford some luxuries. The old adage is true to-day as ever, that the farmer feeds them all. If he is a good farmer, and if he planted his fruit trees of the different varieties, and has arranged his kitchen garden so that it will give him a variety all through the season, he can have the first cut from everything, while our city cousins have to take what is left.

One of the greatest blessings bestowed on man, and one that is, perhaps, the most conducive to health, is pure water. Here is where the farmers have a luxury that people living in the city know nothing about. They can slake their thirst with the purest and best cordial, that comes laughing and gurgling out from every hill-side, while the city resident has to drink the poison water that has been strained through miles of corroded pipes.

Think of the aroma that fills the air on a bright June or September morning in the country. Who is there that would exchange it for the odors of the city gas-house or the blast furnaces. But I hear someone say that there is nothing to be seen in the country. I would say to such, lift up your eyes and look. If you believe that, you have been blind all your days. You can see wonderful things.

Look at the worm that is to-day crawling at your feet, and to-morrow is developed into the butterfly, and behold the wonderful transformation. Or you can look at the blade of corn as it bursts open ground and comes up to the light, as Whittier hath sung,

"All through the long bright days of June
Its leaves grew green and fair,
And waved in hot midsummer noon
Its soft and yellow hair.

And now, with autumn moonlit eves,
Its harvest time has come;
We pluck away the frosted leaves
And bear the treasure home."

Or if you are a true farmer, and have adorned your home with shade trees, the singing of the birds in the morning and their madrigal at nightfall will be sweeter music than city can provide.

Some farmers have got the mistaken idea that manual labor is degrading, that it is derogatory to character; and when in the presence of what they call professional men will crouch and cower like the belabored hound beneath his master's lash. That is all wrong. It is just the way to lose self-respect and also the respect of the community. If farmers do not respect themselves others will not respect them. When you see a dog in the street with a mean, sneaking look, everybody is hazing him. But if he pricks up his ears, wags his tail and stands his ground he will have plenty of friends. This is a homely illustration, perhaps, but it is nevertheless true. Farmers, if they have the moral worth, should assume an air of dignity, and stand up in their manhood and feel proud of their lordly occupation. They should take an honest pride in the performance of manual labor.

Says Bishop Whipple, in eulogizing labor, "The true glory of our nation is in the living temple of a loyal, industrious and upright people. The busy click of machinery, the merry ring of the anvil, the lowing of peaceful herds and the song of the harvest home are sweeter music than poems of departed glory or songs of triumph in war. The vine-clad cottage of the hill-side, the cabin of the woodsman and the rural home of the farmer are the true citadels of any country. There is a dignity in honest toil which belongs not to the display of wealth or the luxury of fashion. The man who drives the plough, or swings his ax in the forest, or with cunning fingers plies the tools of his craft, is as truly the servant of his country as the statesman in the Senate, or the soldier in battle."

In conclusion, let me say that the soil, which gives with generous benevolence, lifts up her voice and asks for better treatment at our hands. Society demands that we should be better farmers, better men and women, and more enterprising citizens.

Farmers should never make the mistake of being dishonest, either with their farms, with themselves, or with those they come in contact with in their business relations. We should always remember that success in life never fails to attend those who unite principle with talent and industry.

PENOBSCOT COUNTY.

Institute at Orrington.

By invitation of the Penobscot County Farmers' Club, the Institute for Penobscot County was held at Orrington Grange Hall, December 29th. There was a large attendance throughout the day and evening. Entertainment was furnished for all present. A choir of singers furnished excellent music.

The meeting was called to order by the local member of the Board, J. E. Bennoch, who invited A. G. Kent, President of the Farmers' Club, to preside.

The subjects for the day were selected by the Farmers' Club. For the forenoon a discussion was arranged on the subject of

CATTLE FEEDING.

By Z. A. GILBERT, Secretary of the Board.

Mr. President, Ladies and Gentlemen:—It is very gratifying to meet so many interested people here on this occasion. Although we have never before met in this town, yet we have before met with this Farmers' Club, under whose auspices we are convened at the present time. It is supposed that our work needs but little of introduction to you, as our methods and practices are familiar to you.

We are here for the purpose of discussing topics selected by this Farmers' Club. We know that the subjects which you have selected are of vital importance to successful agriculture. We know, too, that they are subjects which you have had under consideration;

and knowing as we do the intelligence of the people of Penobscot County, we understand fully as well as you that we must discuss those topics intelligently. We have always found that these meetings draw together a class of intelligent, thoughtful people, well read on all farm topics. Still, through a multiplicity of testimony there comes more of conviction than can be secured from a single individual, and if we do not bring anything new to you to-day, by repeating what you have before heard, adding our testimony to yours, we may perhaps do something further in advancing a knowledge of agricultural affairs. It has been my privilege before to speak to Penobscot County farmers of the importance of stock husbandry and its bearing upon successful agriculture. We start out this morning with the statement that *successful farming is dependent upon cattle husbandry.* This may be contradicted by some of the farmers in the vicinity of Bangor and in sections of the county bordering on tide-water transportation. I know that a considerable number of farmers are carrying on a successful business by the sale of products from the farm, hay being an item of leading importance. These farmers are the exceptions to a general rule. I lay it down, subject to this exception, that the successful farming of Penobscot County is to-day dependent on cattle husbandry in its several forms. This being the case, then of course the business is dependent on the methods and practices through which we pursue this cattle husbandry.

The question becomes of leading importance among us. Without intending to dwell on the reason why or to prove the position that our farms are dependent upon cattle husbandry, I pass more directly to the subject under consideration, with the further statement that success in stock husbandry is dependent on intelligent feeding. This is the basis of successful stock husbandry, therefore of successful farming.

So you see the importance of the subject which you have selected for us to consider here to-day.

Stock husbandry is a different business entirely from what it was under former conditions. In earlier times our farmers prosecuted a successful stock husbandry through their pasturage and their hay mows. To-day good feeding is something different from pasturage and a barn full of hay. Under the conditions existing at the present time—under the competition that we are meeting from other sections of our country, we are obliged to do more rapid work than was done by our fathers. The slow process of growing a steer up into a beef condition through three, four, five or six years, has gone by. The slow process of securing what milk can be obtained from a cow through pasturage in summer and the hay mow in winter, and nothing more, has gone by. The returns from such operations are too limited. While they met the wants and conditions at that time, they are entirely inadequate for our wants at the present day. Well do I remember the farrow cow of the years gone by, milked in a three-pint basin once a day. Amply sufficient, of course, for the limited supply called for by the family, and furnishing nothing beyond this whatever.

The cows during a little while in early summer gave a liberal flow of milk, but the rest of the year it was limited. Such work is too slow for the present age altogether. Followed at the present time, instead of working out success, a man would work out ruin and bankruptcy.

In place of the fattened beef six or seven years old, it must be but three or four years of age. With the cow, instead of the limited returns of former days, we must secure a liberal flow of milk carried through the entire year. If we do not we cannot meet the expenses of keeping the cow and leave a profit. If we do not do this with the steer we cannot pay the cost of keeping. So we are brought face to face with the necessity for more intense and rapid work than we were formerly called upon to perform. This more intensive work calls for different processes in order to secure these results. It cannot be done with hay and grass alone. We know that grass is sometimes called a perfect food. While not quite admitting that in in full, we are ready to admit that it is good food, and one, where furnished in a continuous abundance, that does very satisfactory work. But unfortunately for us, this continued abundance is not forthcoming, and cannot be secured in quality to satisfy the demand through the entire year. There comes in, then, a necessity for combining some other material with this grass and hay fodder, in order to bring these more intensive returns, and through that, a better profit than would be otherwise possible. Careful feeders, through their close observation and critical study of the work, have come to be experts in the direction of securing results through the feeding of animals. Now, instead of the steer simply holding its own through the winter season, feeders are able to gain him a pound and a half and possibly two pounds per day ; and it makes quite a difference between the old practice and the new and doing it continuously, day after day, and through such intensive work securing a profit where otherwise there would be loss. This is done by mixed feeds; it cannot be done with grass or hay alone.

There is a necessity for this mixed diet among cattle of all kinds. I have been much interested with the results that have been secured at the experiment farm connected with the Agricultural College at Guelph, Canada, where they are carrying on experimental work in the matter of feeding stock to an extent that is not equalled at any other place in America. Their work has been carried on for several years and has illustrated facts of great value. Their figures show emphatically the importance of a mixed diet for stock of all kinds.

We have entertained the idea that when we were feeding good clean English hay—clean, dry and sweet, that it was good enough. But it is neither good enough, nor is it profitable for us to rely upon alone.

Science is coming in to aid us somewhat in the solution of these problems of feeding, and while practical farmers cannot depend wholly upon science to lay out the way for them, yet, without question, it has explained many of the knotty problems connected with the work, and will help us still further, without doubt, in the future.

While I do not propose to speak upon the scientific bearing of mixed rations, nor propose to lay out mixed rations, yet just at this point I will refer to the relations of science and practice in this matter. I know that farmers are somewhat afraid of science applied to agriculture, but there is nothing about it to be afraid of. Scientific farming means, in good homely English, good farming. No one can feed a steer to a rapid growth, no one can secure bountiful returns from a cow, unless it is done strictly in conformity with scientific principles. Such work is done through a correct application of science to the business and cannot be done in any other way. So whenever a farmer is doing this he is applying science to his operations successfully; and certainly successful results are not very frightful to any of us.

The mixed ration gives to the animal what its nature calls for, what the demands made upon it call for. The different results coming from a mixed ration and the diet on a single article of food comes from the fact that the animal system is fully supplied with all the elements needed, and at the same time is not called upon to digest useless material.

Give an animal a food made up of all the elements its system needs for the work it is doing, and in such proportions that it all will be utilized, and the system will bring out the best possible results. No single food material does this. This in brief is the philosophy of the mixed ration.

Prof. BALENTINE, Orono.

It seems to me that I have spoken before the Penobscot County Farmers' Club on topics that have drawn in this question of cattle feeding, and I presume that the talk I shall make to-day will be very much like what you have heard before from me. But I am expected to come here and make this talk, simply because I am not accredited with knowing anything that is *practical.* The Secretary of the Board has alluded to one point I suppose he was afraid I should forget. That was the caution he gave you at one time, not to take too much stock in science. At another time he told you not to be afraid of it. I want to emphasize his first remark. There is no scientific man living who can come here and tell you, if you have not good common sense and practical knowledge of the subject, how to feed cattle successfully. I don't wish you to forget that point, whatever else I may say.

Some men credit us with knowing almost everything, while others go to the opposite extreme. There are but very few questions connected with the feeding of cattle that, if asked point blank, and requiring an answer of yes or no, that any scientific man would answer at all. As illustrating some of the questions that are asked scientific men, I will give you an example. I have a letter in my pocket that I received the other day from a gentleman in the central portion of the State asking me to give him a formula for compounding a fertilizer that should furnish a complete manure for potatoes. Knowing nothing of the farm, it is absolutely impossible for me to write out a formula that will fit his case, except it be by chance.

I suppose that I am called upon to go over, superficially—necessarily so—this question from a scientific standpoint. I will speak first of the composition of feeds. We all know that fifteen pounds of oat straw fed to a horse or cow produces a result entirely different from fifteen pounds of oats fed to the same animal. And the question that arises is, Why does it produce a different result? In order to answer it we must go into a closer analysis of the materials than we give in pounds. Considering these feeds chemically, they both contain the same elements and the same compounds, but in different proportions. They are both made up of a class of compounds known as proteine or albuminoids, and another class called carbohydrates, also fats and the ash of the plant. This is as fine an analysis as we care to go into to-day, and perhaps will suit our purposes tolerably well.

Now, a certain quantity of albuminoids are necessary to keep up the vital processes, or else there will be a falling off in flesh. No matter what the quantity of food, if you feed with carbohydrates alone the animal will surely starve to death. That at least some have found out by experience; and very many of you have noticed the result of feeding straw alone, in which there is an insufficient amount of the albuminoids to keep up the vital processes, and have noticed the falling off in the fat and in the flesh, while the animal grows weak, and comes out, as you say, "spring poor."

Now, in order to obtain the best results in feeding for fattening purposes, you should have a feed that shall combine albuminoids, carbohydrates and fats in the right proportions for that purpose. But in order to have the feeding successful—meaning not only successful in the production of milk and flesh, but successful financially—we find that the materials furnishing the largest proportion of albuminoids are the most expensive. For instance, while you have in oat straw and hay a deficiency of albuminoids, there is an excess of carbohydrates; while in cotton-seed meal, in corn meal, and in bran, you have a large proportion of these albuminoids, which are necessary for the formation of flesh and for keeping up the vital processes in the animal. In order to feed and obtain financial results which shall warrant you to continue the business, you want to compound a feed in which such a quantity of the albuminoids shall be given as will satisfy the conditions and purposes. If you furnish more albuminoids than are necessary to keep up the vital processes, or to supply albuminoids for the milk and flesh, they may still be valuable to be used for other purposes, only we have the cheaper carbohydrates and fats that will serve the same purpose and at less cost.

While it would be impossible for a person to give the exact proportion of albuminoids and carbohydrates and fats that a feed should contain to suit every purpose and every animal, in order to produce the best possible results financially; yet there are some guides which will give an *approach*, perhaps, to the desired object. From experiments made at German experiment stations, the conclusions that have been arrived at there have been that a feed containing two and a half pounds of digestible albuminoids, about twelve and a half pounds of carbohydrates and a half pound or so of fat will give a feed that is perfectly reliable in giving good results when fed to milch cows.

I think we may depend upon this, that in order to get good results we must have a sufficient supply of albuminoids and in much larger quantities than have been fed to stock in the past.

No scientific man would attempt to tell what is good for a cow. Science simply demonstrates to us why a mixed ration is better, and why better results come from a mixed ration than from a single kind of food; but it belongs to the practical feeder to tell whether he is feeding in the right direction. In the chemist's laboratory it is impossible to tell. You must go into actual work to do that, and while experimenting, remember it is the animal that tells you. If you do not watch the animal to see the results of the feeding you will not learn the lessons aright. As long as the appetite is good and the animal is healthy you may know that you are not injuring the animal. Then comes in the further question, whether your ration is properly balanced. That must be judged by the results of the work. If you are feeding liberally of a specific food and the animal is not growing, you know there is something scientifically wrong about it; you prove it by practice. If you give a ration that is properly balanced, and feed that ration to the animal properly, I do not believe that the animal will eat enough of it to hurt him.

G. M. GOWELL, Superintendent of College Farm.

Prof. Balentine has called your attention to the standard ration as determined by German experimenters. It is understood that we all accept the fact that there is a certain standard of relationship of the carbohydrates and albuminoids that is necessary to maintain in order to secure the best results. There is another point which I would call attention to—why we should add concentrated foods to the bulky ones; why, in addition to the hay, we should supply the lack in the form of grain. If in the hay we feed the ratio was just what we want, it would still be too bulky to get the best results. We want to add something in order to induce the animal to consume

6

and digest more and give us better results than if fed hay alone. The question of economical feeding is a subject of considerable importance. We are now feeding cotton-seed meal at one dollar and forty cents, and corn meal at one dollar and sixteen cents, and bran at one dollar a hundred. Our rations for milch cows vary with different animals. The maximum at the present time is, per day, two and a fourth pounds of corn meal, two and a fourth of cotton seed, one and a half of bran. The minimum is one and a half of cotton and corn, and one and a half of bran. We are using these feeds in connection with our hay. Our hay is not clear Timothy, but mixed; herds-grass, red top or Alsike clover. We have hay which of itself furnishes a very good ration of albuminoids and carbohydrates, but this hay alone is not sufficient, because it is bulky, and we cannot induce the animal to eat enough to get the best results.

It is a question at the present time whether we had best continue the use of cotton-seed meal at present prices, or exchange it for corn meal. In feeding young cattle, growing heifers for the dairy, and steers, we feed very little but hay until two years of age. One and a half pounds of bran, in connection with good hay, is the extent. By this slight attention the animals are matured and brought forward more rapidly than under the old system of feeding.

Sec. GILBERT.

I want to throw in the caution that no attempt is made to figure this ration business down fine. Mathematics alone cannot be depended upon in this kind of work. Theoretical rations are reliable if one does not place too much confidence in them and does not attempt to depend upon them exclusively. They may be made, and are being made by some, a great aid to successful and economical feeding. Close attention and good judgment on the part of the feeder, however, must go with them. We know the contents of the corn, the cotton-seed meal and the hay, and knowing the wants of the animal, it may seem an easy thing to meet those wants exactly. Just here comes in the difficulty—we do not know the wants of the animal. No fixed rule will apply. One of my cows is fleshy, and she needs a different ration from another at the other end of the row that is in poor condition. Another has a strong tendency to milk, and under any treatment is liable to grow poor. Those two cows don't need the same ration. Another cow is a two-year-old heifer and you want to make growth as well as milk. Another is an old cow and you want to maintain the flesh while she throws her efforts into milk.

These two animals do not want the same treatment; the same ration will not answer. The most we can do and say, then, is that we must give a mixed ration, a ration of these various kinds of feeds, and then the feeder must watch the effect on each individual animal, and vary the proportion of the albuminoids and the carbohydrates to the wants of the different animals. Do not expect, then, professors of agriculture or boards of agriculture to draw out with mathematical accuracy and put into print the form of ration that is conclusively applicable to every individual animal. It simply cannot be done.

AFTERNOON.

"Improvement of Run-Out Soils" was the subject assigned for the afternoon, and was discussed by Prof. Balentine of the College, D. B. Johnson, member from Waldo, Mr. A. I. Brown of Belfast, and many other farmers present. The report of this discussion is not given. In the evening, "Some Phases of the Poultry Business" was the subject of a lecture by Dr. G. M. Twitchell, Readfield, which will be found given in another place.

WALDO COUNTY.

Institute at Belmont.

The Institute for Waldo County was held at Belmont Grange Hall, January 8th. The weather was unfavorable in the extreme, yet the attendance was very good. There were present of the members, D. B. Johnson, Waldo; S. L. Holbrook, Sagadahoc; J. E. Brainerd, Kennebec; J. M. Deering, Saco; also Hon. D. H. Thing, Lecturer of Maine State Grange.

STOCK FARMING.

By D. B. Johnson.

We have met here to-day to talk of the "old, old subject," How shall we best manage our farms, that they may produce abundant crops, and return us a profit on the same? Though the subject is one that has been considered for a century, it is one that will bear a good deal of investigation for time to come. The tilling of the soil is the oldest occupation among men, and yet how little we know of our business, further than a knowledge of our own littleness. Too many of us are willing to follow in the old ruts of our parents and grandparents, and then if our crops are not equal to those of earlier days, we are apt to repeat the cry of many others, "The land is all run out—it is just fit to grow up to bushes, and I am going west!" Yes, going out west, or somewhere, that you may "get a living easier." Is it strange that the earth ceases to produce for such tillers? People talk of the so-called professions as though they were of more importance, and as if the person who could affix to his name M. D., D. D., or LL. D. was the only person of any importance. But the person who can write "Farmer," in its fullest sense, as his occupation, has no peers. Tilling the soil requires just as much of an education to fit the tiller for his business as any other occupation, and were the tillers educated for the business, like the professions, we might find quack farmers as well as quack professors, and humbugs alike in farming as elsewhere. Honest study and labor are required in all occupations, and he who expects to meet with success in any calling without taxing both brain and muscle will be apt to meet with failure.

Many of the best scholars of the day are tillers of the soil and are giving their whole time to the grand work. This valuable information is for us if we are willing to avail ourselves of it. "Yes," you say, "this is book-farming, and what does it amount to?" True, there is chaff with all grain, but a little labor will separate the kernel from the chaff. It is our duty to secure all such aids within our reach, that we may be enabled to keep pace with the times and honor the calling we have chosen. As the country grows older, competition becomes sharper, and the demands on the purse are greater than in early days, and it is necessary that we make our farms produce better crops, and that we market them in the best possible manner. To produce such crops as will pay the best, we must consider carefully our own surroundings, not our neighbors', as to whether we will produce the beef, mutton, wool, dairy products or fruit. When we have decided what is best for us to pursue, then we should put our whole mind and strength into the work and pursue it with an even hand through all ups and downs, and success will be our reward. No farmer can do much who changes his business every time the markets change. The farmer who one year ago, when wool was low, sold out his flocks and invested in steers, with hopes of high-priced beef, finds himself to-day ready to sell his steers and invest in sheep, that he may raise some early lambs for the market and some wool for the future rise. By his shiftlessness he has lost one year's profit on his farm. Old Davy Crockett said, "Be sure you are right and then go ahead." It has been said there is no better word in the English language, or one that will so fasten a person to any place or undertaking, as "stick."

We often think we are right and do not learn of our error until much valuable time has been lost. "True ability is not in never making mistakes, but in rising above them." All are liable to err in their judgment and in their various undertakings, and if in any of our farm labors and experiments we meet with difficulties, or make a failure in some new experiment, let brother farmers know of the failure as well as the success. They may, thereby, be enabled to avoid the error and benefit by the success.

The question often is asked, Would it be better for farmers to engage in some special branch or carry on a mixed husbandry? I think it would be better for most of the farmers to have some special branch that his farm is adapted to, and develop that the best he can, and investing the greater part of his capital in that particular direction, his returns will be larger. We do not have either time or capital enough to engage in so many branches as many do, and make any one of them profitable.

Have we as good a chance to farm it here in Waldo County as elsewhere? I believe there are as many good chances for farming here as in any part of the State. Go where you will, and you find no place where the sun always shines. In some parts of the State you may find a soil that is better adapted to the rearing of stock than here, but when you take our county for all the branches in which her people are engaged, the situation is well enough. The condition of our farms, however, may be improved. The undeveloped resources of Waldo County would support many times our present population and furnish them with food and raiment. We now are going west for a large part of our bread, some of the butter and cheese and also part of our meats. Truly it is "Bleeding Waldo." The trouble is not with our soil, but with us as tillers of the soil. Our situation is much the same as with some of the other seaboard counties, though our industries vary somewhat. For example, Cumberland has, like Waldo, a part of her population engaged as seafaring men. This detracts much from the cultivation of the land on the immediate seaboard. Cumberland is engaged quite extensively in manufactures, with a population of 86,359, and manufactures goods to the amount of $16,540,198. Waldo, with a population of 32,463, manufactures goods to the amount of $1,107,574, or thirty-four and one-sixteenth dollars to each person, while Cumberland manufactures one hundred ninety one and one-half dollars per capita. Now it is a conceded fact, that where manufactures prevail to quite an extent, there you will generally find farmers the most prosperous. Let us see how the agricultural statistics of Waldo compare with those of Cumberland. Waldo has 4,277 farms, and 245,333 acres of improved land. Cumberland, 5,415 farms, and 245,538 acres of improved land.

The agricultural products of Waldo are $344 per farm, those of Cumberland, $362. Two of the leading products of Waldo County are hay, 86,881 tons, and potatoes, of which 448,550 bushels are produced. Cumberland, of hay 80,316 tons, potatoes 381,410 bushels, Waldo producing 6,561 tons more of hay and 67,140 bushels more of potatoes, an excess in value over Cumberland of $103,720. The stock products of Cumberland are $2,005,336, and of Waldo $1,534,633. Cumberland's excess over Waldo in the value of stock is $470,703, from which deduct the excess of the hay and potato crop of Waldo over Cumberland, and we have $366,983, and in a county producing less hay than Waldo. The two leading products of Waldo, hay and potatoes, exceeding Cumberland by $103,720, and yet the stock products of Cumberland exceed those of Waldo by $470,703. Kennebec is an inland county and her farms contain the same number of acres of improved land as our own county. Her farm products are $424 per farm. The stock and its products of Kennebec are $2,005,202. Now, in our comparison of Waldo with Cumberland and Kennebec, may we not deduce the truth, that if the farmers of our own county were engaged in manufacturing their hay into stock and its products, it would be far better for them than selling hay and potatoes?

In the foregoing comparison, we find that in the products from the soil Waldo ranks well with other counties, while in the stock and its products her rank is low. What are the facts that we may gather from the above? Is it because we are selling our farm products in bale and bushel instead of in beef, mutton, butter, cheese and wool? Is it because they have better markets? Or is it because they are better farmers? I hardly believe they are better farmers, for the crops of this county will compare well with either of the above counties, and certainly they have no better markets.

I believe the true course for the farmers of this county is to reduce the tariff upon their market products by reducing the bulk to be shipped abroad, not to produce less, but more in beef, butter, wool, etc. To illustrate, A keeps a dairy, lives twelve miles from railroad and has 500 lbs. of butter which he wishes to send to Boston. He takes his breakfast at the usual hour, harnesses his horse to the wagon, drives to station and sends his butter to market that day. The next morning it is in some of the stalls in some one of the leading markets, and in less than one week, often, he receives a check of $100 to $150 for the butter. His neighbor has fifteen tons of hay to sell at the same time, and he decides he will let neighbor A know he can ship hay as well he can his butter. So, a day in advance, he engages all the teams far and near to assist him in his labor. Bright and early the teams begin to gather, some one-horse, some two-horse, and after a couple of hours of labor and confusion, they start upon their journey for the land of Goshen. Truly it reminds one of those vast caravans that we used to read of in the geography as they crossed the Desert of Sahara. In due time they arrive at their destination and apply for a car on which to ship their hay to Boston. He finally procures the desired cars and after much labor and fretting sees his goods start for the market. In about thirty days he receives his returns, and, owing to delay, hay is not as high as when he started upon his enterprise, and is down in the high price he expected. I leave you to strike the balance and tell me which man received the most for his labor. If the picture is overdrawn just paint to suit your own taste. This one fact you must acknowledge, that A had his products where he could reach the market when it was active, and his goods sold quick. Last, but not least, he was not reducing the value of his farm by selling his butter, as was his neighbor, to the snug little sum of seventy-five dollars, or five dollars per ton, which is very near the manurial value of every ton of hay sold from the farm. Farmers of Waldo and the State of Maine, which is the best course?

The important question just now is, can we follow the practice of selling hay, and our farms still continue to produce as well as though we fed the same to stock? Among the truths recorded centuries ago, none are more important than the one by the old Roman farmer, namely, "Cattle are the foundation of all riches." Sir John

Lawes, of England, says, "The relation between grain and the various animal products is no longer what it was. While the former has a continuous tendency downward, that of the latter continues to advance. There can be no reasonable doubt that profitable agriculture in the future will depend, more than it has ever done before, upon the successful management of farm stock."

One method by which worn-out grass fields have been restored, or, more properly speaking, renewed, here in this part of the State, is by shallow plowing directly after haying, and re-seeding with Timothy. If clover is to be sown it is usually done early the following spring on the snow. In many instances no manure or fertilizer is applied. Can that method be practiced by all? If so, then, what need of going west to engage in sheep husbandry while there are so many farms that can be purchased here in Maine for just what the buildings cost? I believe that the ploughshare should be kept bright and that it must be done by inverting the sod once in four years. If possible, I would make it a five-years' course, first year hoed crops, second, grain and re-seed, then three years grass. Many advocate the following course, and it is practiced by some in this State. Plow and re-seed to clover, pasture one season with sheep, plow and re-seed again to clover and again pasture with sheep. Then plow for the third time and re-seed for hay. This is recommended as producing good results. I cannot speak from personal knowledge of this method, but it has the true principle in it, and I believe would be practical. Some of the natural grass lands of our State will continue to produce hay for a long time. The wash of the uplands serves to keep the intervals in the proper condition for good crops of hay. The question of where the hay that is required to supply the markets of the world is to come from, is one that need give us very little trouble, for the supply will always follow the demand, and it will come from those sections where it can be produced the cheapest. Judging from the past, Waldo County has been furnishing a little more than her proportion. The farmers of the western part of Maine estimate their hay at nearly the same figures to feed to their stock as the farmers of Waldo receive for their hay in Boston. Are we not losing by selling to dairymen of Massachusetts that they may furnish the cities of that State with their butter, cheese and milk? Would it not be far better for us to furnish the last-named products than the hay, and fertilize our farms, while doing so, instead of the sterile farms of Massachusetts?

Fashions and customs change after having their day, and it does seem that the custom of selling hay has had a run that might answer for this section, and that we now would do better to allow some other part of the United States the opportunity of selling their farms by the ton. Let every farmer who has been selling hay and who is now aware that his farm is failing to furnish the amount as in years gone by commence to feed it on his farm, either for dairy products, beef, wool, mutton and early lambs, or horses.

The question is often asked, What does it cost to grow our hay? The old saying is that any person may ask questions but not every one can answer. In the Agricultural Report for 1884, we find by Mr. Murch's estimate of the expense of growing a ton of hay, when grown for the market, to be from eleven to thirteen, usually about eleven dollars and sixty cents. When grown and fed upon the farm, from five dollars and fifty cents to six dollars and fifty cents. You are to bear in mind that when we feed the hay, the manurial value is an important factor. Now, when we estimate the cost of a ton of hay it makes a vast difference whether we solve this problem upon soil that is well adapted to the growth of the grasses, especially Timothy. I understand this is the case with Mr. Murch's farm and several of the other parties who have given their own cost of growing a ton of hay.

The first of May, 1883, I prepared a piece of ground for corn by first spreading barn manure from the cellar beneath the cattle tie up, at the rate of seven cords per acre. The land was then carefully plowed from five to six inches deep. Seven cords more were then spread upon turf and thoroughly pulverized, and mixed with the soil, using the La Dow Disc Harrow. The ground was then marked off in rows three feet apart, hills two and a half feet, three hundred pounds of superphosphate applied to the acre, in hill, and planted to corn, beans and pumpkins. The beans were planted equi-distant between the hills of corn, pumpkins in one-eighth of the hills. [The pumpkins were of such a rank growth as to damage the corn and beans.] The following was the result:

FIRST YEAR.

Field Dr.		*Cr.*	
To 14 cords manure	$49 00	By 55 bushels corn	$44 00
" applying same	7 00	" 5 " beans	9 00
" breaking land	6 00	" 4 loads pumpkins	4 00
" harrowing, hauling stone and working	2 00	" 2 tons straw	12 00
" fertilizer and applying	6 50		
" seed corn and beans	50		
" planting	1 00		
" cultivating	3 00		
" hoeing	2 00		
" harvesting corn, beans and pumpkins	11 00		
" interest on field	3 00		
Total	$91 00	Total	$69 00
Field debtor	22 00		

SECOND YEAR.

To plowing	$2 00	By 22 bushels wheat	$27 50
" harrowing	2 50	" straw	10 00
" seed wheat	3 18		
" grass seed	3 25		
" harvesting	2 00		
" threshing	4 00		
" interest on field	3 00		
Total	$19 93	Total value	$37 50
Field debtor	4 43		

THIRD YEAR.

Brought over	$4 43	By $2\frac{1}{2}$ tons hay	$25 00
To carting and storing hay	3 00		
" interest on field	3 00		
Field debtor	$10 43		

The crop of hay has cost me $4.172 per ton, and leaving a profit on the acre of land of fourteen dollars and fifty-seven cents, or four dollars and eighty-five cents a year above all expenses. I have received the pay for everything furnished, labor performed, and interest, and now have a field that will give me two or three good crops, and then be in good condition for another crop of corn. It will be left far better than when I commenced two years ago. Some may not agree with me in my method of figuring the above account. My rule is to pay as you go if possible. Now, when I can farm it and obtain a fair compensation for my labor, as above, and pay all bills in three years, as on the foregoing field, I think I will stop in Waldo County.

I believe the true course for the majority of the farmers in Maine is to feed the hay upon their farms. Feed to that class of stock that is best adapted to each particular situation. If feeding for beef or mutton, the animal that matures young is the one that pays the best. Early returns are the requirements in this age of steam and electricity. It is the "early bird that catches the worm," and a "nimble sixpence is better than a slow shilling." Never send poor animals to market, for when you do they will not much more than pay the freight. Good, well-fatted beef or mutton will always bring a fair price in market.

All are looking forward to the millennium of agriculture, when every tiller of the soil may cause "two blades of grass to grow where but one grew before," when our hills and valleys shall be covered with a rich sward of green, and be fed by flocks and herds rivaling in beauty of form the most fancy ideal of the painter or poet. But to produce this, we must, like the artist who saw the form of beauty in the rough block of marble, have the ideal pictured upon our minds, and then we must seek to grow what we desire, remembering that time and patience will accomplish all things. I believe that here in Maine we have all that is required to make our State one of the most prosperous in this Union. We have a good soil, a good climate, and an industrious, progressive people. Therefore let us seek to elevate our calling and not feel ashamed to own that we hold the plow for a living. No matter what a man's calling may be, he can honor that calling or he may disgrace it. But labor never disgraced a man. Let us carefully study our business and become masters of it. If we are farmers, then let us love the work, for there is no occupation where a person can so enjoy the good things of life as upon the farm, where cares are so few, where, if there are not great riches, surely there is not that squalid poverty that you will find in the great cities where wealth and poverty dwell as neighbors.

ANDROSCOGGIN COUNTY.

Institute at Auburn.

SILOS AND ENSILAGE

Was the general subject for consideration at the Farmers' Institute for Androscoggin County, held at Auburn Hall, in the city of Auburn, on Tuesday, the 12th of January. A wide interest was felt in this subject and it drew out a large attendance of representative farmers. The meeting was called to order by the Secretary of the Board with the following introductory remarks:

I believe it is well understood by all present that we are here to-day for the purpose of investigation in the special direction of the subject of silos and ensilage. While this subject has been before our people for a considerable number of years, and a few individuals, here and in other parts of the State, have been preserving fodder by this method, there is a desire on the part of still others to know more of this subject, or rather, perhaps, to know it more certainly. There has been a great deal of empirical statement floating around from individual to individual and through the public prints, with but little of a basis shown on which to found these statements. Our farmers generally—to our credit be it said—possess a measure of caution. They are obliged to exercise economy in all of their outlays, consequently, if a new method of work presents itself, they want to measure it fully and obtain reliable information in regard to it before any considerable outlays are made, thus avoiding a waste of property and many useless mistakes. Certainly this precaution is a credit to our farmers. After these years of experimentation we ought certainly to know something definite in regard to this method of preserving fodder and feeding stock. There has been something learned; there has been something put on record; and we are here to-day to bring to the attention of the farmers of the State some of the present knowledge of the subject of silos and ensilage. This meeting for the entire day is to be given to this matter. While it is to be presented in the form of a lecture, we want you to understand that it is an informal one, and that you have the privilege, which is cheerfully tendered to you, of giving direction to it during the day by calling up such points as you may desire. We do not propose to spend much time with preliminaries this morning. I make this introduction myself in behalf of the Board, and for the further conduct of the meeting will call upon my associate, Mr. Ham, to whom this meeting properly belongs, as the local member of the Board of Agriculture.

NELSON HAM.

While the Secretary has alluded to the object of this meeting, I would simply say further that I now have the pleasure of introducing to you Major Henry E. Alvord, of Houghton Farm, New York.

OUR PRESENT KNOWLEDGE OF SILOS AND ENSILAGE.

By H. E. ALVORD, Houghton Farm, New York.

It is with pleasure that I again come to this State, at the invitation of the Board of Agriculture, to attend meetings of the Maine farmers for the consideration of practical subjects. Twice before I have had that pleasure, though coming rather differently than I do now. Three years ago I came especially to help discuss the feasibility and the profitableness of the associated system of butter making, the advantages of the butter factory, in which I fully believe; and I have the gratification of knowing that in both the places that I then visited successful factories are now in operation, as well as elsewhere in the State, resulting partly from that same effort. A year ago I came again to assist in advocating the establishment of an experiment station for the benefit of the agriculture of the State, believing fully in the value of such an enterprise and in its benefit to the tax payers of the State of Maine. In both these cases my position was that of an advocate, convinced, myself, fully as to the value of those measures which I urged; and the facts being so thoroughly proven from past experience and satisfactory to myself that I could take the very decided position I did without any equivocation whatever. I come this time in a very different capacity. This subject of the silo is newer, in a much more uncertain and experimental state than either the question of butter making by the factory system, or any question about the usefulness of experimental agriculture systematically conducted. Consequently, as far as this subject is concerned, I am simply occupying the position that all of you do who have given the subject any attention—that of a student and inquirer into the matter. I can therefore simply contribute to this meeting, as the Secretary has well said, something toward our present knowledge, for our knowledge is constantly progressing on this subject. I have taken advantage of an opportunity for a close examination of this subject in its various forms for several years.

As explanatory, rather than for any other reason, it may be perhaps admissible for me to make a statement in regard to the way in which I happen to be investigating silage, as well as other things. Several years ago a wealthy gentleman in the city of New York, being very fond of the country and country life, and to whom farming had always had a great attraction, although he never lived upon a farm until he bought his in later life, decided to establish a country home as near as he could to the city of New York, and, at the same time, to couple with that home a farm. Because of the frequent claim that farming was unprofitable, was running out in the East, he wanted to make a standing proof of the profit of the business of farming conducted in a progressive and enterprising manner. He believed that money invested in farming, closely watched and properly managed, would be, while perhaps not as largely or rapidly remunerative, still as safe and sure an investment as any other business in or about New York City. With that faith he put about one hundred thousand dollars into a farm and its equipment. He found, in the first place, living upon it as he did with a large and expensive family, as a country gentleman might, that he could not determine anything about its profits as long as his residence and his farm were mixed up. Consequently he saw plainly that the line between the residence and the farm had got to be distinctly drawn before the farm would show what it was in a business-like style. Therefore the thing was arranged so that the highway did actually cut off the residence portion of the estate from the farm proper. And then he invited me to take the management of the farm alone and see what it would do. Our first object there is to make money, to make the farm a success, and in that respect we have been passably successful during the last four or five years. We have never lost money on the farm by our year's work until the year 1885. One year since 1880 we made a cash dividend of thirteen per cent on not quite $100,000 invested. We have averaged something over five per cent in the five years, although last year the farm was carried on at an absolute loss, resulting from the entire failure of our hay crop, which is our principal crop, so that I have been buying hay ever since the middle of November from the State of Illinois; and resulting also from an almost entire loss of the sale of the increase of our live stock, which is our main source of income, owing to the general depression of business. We breed French Norman draft horses, Jersey cattle, Southdown sheep, Essex pigs, and so on through, buying some of the best of the great families of live stock and breeding to get the best of its kind, and our sales, of course, are to some extent uncertain. Last year's sale, of course, was very small, and we have a large stock on hand which we have been obliged to inventory at so low a rate that it shows a loss for the last year. If there should be an improvement this year in the business of live stock, that improvement would partly be credited to the young animals we have on hand that were raised last year, and that would turn the scale, for it would not take a great deal to turn the scale, even for 1885.

The first thing at Houghton Farm is to try to make money, and we have fairly succeeded in that, though under conditions that were anything but favorable when the enterprise was commenced. It was a deserted, neglected and partly-worn-out piece of land, in a very unpromising condition when we took hold of it, and the piece of land itself is not yet in paying condition. Without the live stock upon it we could not hope to make it pay anything.

Question. How many acres are there in this farm?

Maj. ALVORD. We own 1000 acres, but it is largely mountain and rocks and woods; we had about 350 acres that were brought under the plow at some time or other. A 350-acre farm you may say if you please, on which we carry from ten to fifteen horses, from sixty to eighty head of cattle, about two hundred and fifty sheep, from twenty to fifty pigs and about a thousand fowl.

This is the object of Houghton Farm: to prove the possibility of farming on a large scale as well as a small one with profit, within fifty miles of New York City. The owner of the farm says, "I want all the money that is possible made out of the enterprise, but I don't want the money that is made; make all the money you can, and then use it all, for the benefit either of the business itself, or, better still, for the benefit of farming in general; spend your farm income in original agricultural investigation, experiments, study." And moreover, he said to me at first, "If you don't make anything keep up an active experiment department on the farm; if you don't make enough profit on the farm to do that, call on me for help and I will respond." In point of fact, besides our farming on our farm we have been spending several thousand dollars a year in agricultural experiments and investigation, the results of which we contribute to the public press, and publish in the form of pamphlets, some of which some of you, no doubt, have seen from time to time. I ought to state, perhaps, in addition, that we have not been doing so much in that line lately as in previous years, from the simple reason that we are dependent on one man's liberality, and the surplus of even rich men hasn't been as big for the last year or two as in previous years. We have been short of money, like everybody else, and have been obliged to be economical. So for two winters we have published no large and expensive pamphlet, and we have a good deal of material unpublished, which we have been accumulating during all this time; It is a part of this which I have before me to-day.

With this explanation, you will understand me when I say that from the time ensilage first attracted attention in this country we have been giving it careful thought and study. We have for five years been experimenting with the silo to a greater or less extent, in various ways, and have been not only studying it as well as we could scientifically, with more or less aid of chemistry, but have been experimenting in a practical way, by feeding ensilage to all kinds of domestic live stock. And I say, therefore, it is as an inquirer into this subject, who has given it a great deal of time and attention, in the manner and for the reasons stated, that I have consented to come here to-day and do what I can towards contributing to the success of this meeting.

The words *silo* and *ensilage* have come into use, adopted from the French, in connection with a system of providing green forage for domestic animals throughout the year. The plain terms pit, pitting and pitted, would better suit our language, and serve the purpose, but it seems too late to make the change. We must therefore accept the term *silo* for the receptacle, *ensilo*, *ensiloing* or *ensiling* for the verb, and *ensilage* or simply *silage* for the product or pitted material. As different plants are preserved by this method, the word *silage* alone is incomplete and "silage of corn," "silage of clover," etc., is necessary to a clear understanding of the article referred to. Yet custom already allows "silage" to be interpreted as pitted corn plants, maize being the crop used in this connection so much more than all others.

Silo means a pit, and this word in different forms can be traced back across Europe, through Rome, Greece and Egypt, into Persia, in very ancient times. In the earliest agricultural writings the silo or *siro* is described as an underground excavation used for the storage of grain and of green crops, also. The requirements of the ancient *siro* were those deemed essential to the modern silo—protection of the contents from contact with the sides of the pit, if of earth, dryness and perfect exclusion of air.

A knowledge of this method of preserving green forage came to the present agriculture of Europe in a manner that cannot be traced, but is known to have been in practice in Hungary at the beginning of the present century and probably as long in Germany. An account of what was called "Sauer-Kraut for Cattle," can be found in Arthur Young's "Annals of Agriculture" in the form of a letter from Berlin, dated August 25, 1804. The process in vogue in East Prussia was well described by Grieswold in 1842, and other similar accounts exist of its application in Spain, France and Mexico, to the preservation of different vegetable products, including the leaves of trees and vines. In Germany it was especially useful in keeping beet leaves and beet pulp in sugar-making districts. Its application to corn seems to have been accidental, about thirty years ago. It passed from Germany into France, and August Goffart is to be mainly credited with bringing the system to a state of greater perfection and economy than exists elsewhere in Europe. It was also mainly through the efforts of M. Goffart and the attention his work attracted, that the silo was introduced into the United States.

In the year 1873 and again in August 1874, a description of the Hungarian method of making "sour fodder," in the crude trench form, appeared in the American Agriculturist. The same journal published in June, 1875, an illustrated account of the European experiments with ensilage, based upon reports in the *Journal d' Agriculture Practicque* of Paris. It is worthy of note that the much abused United States Agricultural Department Report contained, in the volume for 1875 (pp. 397–468), the first full description of silos and ensilage published in this country, if not the first in the English language. So our ignorance of this subject eight or ten years ago was due to a want of appreciation of that freely-distributed public document. This article is entitled "The French Mode of Curing Forage," and deals with its origin, the silos, the usual methods of cultivating and manipulating crops for ensilage, the effects of fermentation and the value of ensilage in stock feeding. The general principles of ensilage were applied to the preservation of different products in numerous places in America, between 1870 and 1880. Prof. Manly Miles, at the Illinois Industrial University, kept broom-corn seed and the green corn plant whole in this way for months. In dairying districts, brewers' grains were similarly preserved in pits. In September, 1877, the American Agriculturist, under the title of "An American Silo," described and illustrated a dairy barn at Katonah, Westchester Co., N. Y., which contained a cellar or pit, specially constructed for storing brewers' grains and preventing their fermentation and decay by pressure and exclusion of air. Mr. Goffart published his book on ensilage in 1877. This work was noticed in a paper read by ex-Governor R. M. Price of New Jersey, on Friday, December 6, 1878, at the International Dairy Fair in New York City, and subsequently published in the Fair "Proceedings." The farmers and dairymen present gave the subject attention on that occasion and it was then undoubtedly discussed for the first time in a public meeting in America. A translation of Goffart's book was published in New York in 1879, and since that time half a dozen books on the subject have appeared, besides the numberless articles in the agricultural press, with which we are all more or less familiar.

The first person who built silos and made ensilage of corn for cattle food in the United States was Francis Norris, a large Maryland farmer. He saw an account of Goffart's operations, in a French newspaper, early in 1876; at once opened a correspondence; that same year raised five acres of corn in drills and preserved it in silos, and repeated the trial the following year. It was the experience of Mr. Norris that was given at the New York meeting above mentioned. From this beginning the system has rapidly spread in America, and there are now hundreds of silos in use in different parts of the country. They are chiefly in the Eastern and Middle States; over one hundred in Vermont, for example; but they are also as far south as the Gulf States and as far west as Nebraska.

The time probably has already passed for silos and ensilage to have their greatest "boom," as we say. In other words, ensilage came into use, as almost everything does in this country, in the shape of a sort of furor or craze, which seems to have largely died away, and the reaction is now taking place, which is, perhaps, moving to the other extreme. In the first place it was taken up, as most new and revolutionary things are, by inconsiderate men, and represented as doing wonderful things, as creating an entire revolution in farming and the keeping of stock; and the claims for it were so extravagant, so unreasonable, that in a very short time a reaction was produced. A good many men who went into it on the strength of these extravagant representations were naturally disappointed, and then came the reaction; so that I think at the present time that the popular estimation of ensilage, instead of being above what the facts justify, as it certainly was a few years ago, is now below it; and as time passes now we shall think better, rather than worse, of this system and its results. But this whole idea of magic effect, mysterious formation of food in a hole in the ground, taking out more than you put in, has been pretty well exploded; and we know enough about fermentation generally, which is what takes place in a silo if anything does, to know that there must be loss in the process. Fermentation means combustion; and you can no more maintain fermentation without expenditure by combustion of the matter which is fermented than you can make a fire burn without consuming fuel. The question whether a degree of fermentation may be advantageous, and as to the possibility of regulating or checking it, is another matter. It is possible that by a degree of fermentation there may be an advantage in the condition of the material. A man may have a stack of wood and prefer a bushel of charcoal instead; he is perfectly right, of course, in transforming it from the one to the other; and it may, perhaps, be worth more to him in the shape of charcoal than in the shape of wood, but to say that in the bushel of charcoal there is more woody fibre, or more wood, than there was originally in the stack, is highly ridiculous, and to say that the corn fodder, after being fermented, contains more food than it did before the fermentation set in, is at least a statement which needs investigation. I think we are safe in asserting that fermentation gives something; something has to be expended of the material in the course of fermentation. But it is fair to reason that a certain degree of fermentation may cause the woody fibre of our material to assume a more digestible form, and consequently that there may be a compensation in that way for the loss of material which the fermentation involves.

I think it is fair to say that, as a general proposition, silage is better, actually practically better than the chemists make it. That is to say, with those who have handled it its results in practice are better than the theories and rules of chemistry are able to yet explain. I make this statement with considerable hesitation because I am not a chemist, and on the chemical side of the question I know you can get more accurate information from another gentleman who is present, but it is incident to a general presentation of the subject.

Something, perhaps, should be said right here about "sweet ensilage." We read a great deal about it and hear a great deal about it. I have tried my best to find some, but never have succeeded. There is a difference in the degree of acidity, and the only way I have been able to account for some men believing that they had produced actually sweet ensilage, and at the same time be reasonably charitable with a fellow-man, was to reason that he had had such abominably sour stuff in all previous years, that when he got something that was moderately acid he at once concluded that he got loaf sugar. But all my experience with ensilage has led me to believe that the difference in that respect is in the degree of acidity. If fermentation is once started in a silo it cannot, by any process that I know, certainly by any mechanical process, be so varied as to prevent the development of acid in the mass. Of course we may possibly succeed in producing a modified form of acidity; in some silos we may succeed in checking the fermentation at an earlier stage; but I am rather skeptical on the subject of sweet ensilage, and after a good deal of care and a good deal of time and money spent in trials under the different methods advocated, we have not yet succeeded in producing an article without acid; and by the methods that are most advised by men of ability whom we have reason to depend upon for advice in such things we have succeeded in making a good deal sourer ensilage than we have in other ways. The conclusion that I have arrived at myself—and I am free to say I am open to conviction on the subject and should be glad to have a man prove that I am wrong—is that we can modify the acidity of the contents of the silo, and can more nearly reach what may reasonably be termed "sweet ensilage," or ensilage that isn't very sour, I would rather call it, by attention to the age and condition of the plant which we put into the silo than by any treatment of the silo itself, either in the way of cutting short or long, pressing more or less, or filling slowly or rapidly. The best ensilage which I have ever made myself, and the best which I have ever seen, has been from a very well matured plant, and that the plant is in the right condition to make ensilage at all, I find of very much more importance than the way I handle it afterwards.

So general has been the discussion of this subject for several years that it is useless at this time to enter upon a minute description of the process, or the forage thus produced, or to make an argument upon the practical success of the mode of preservation. Certain facts have been so well established as to need no further proof, and it is sufficient to concisely state the most prominent of these accepted truths.

1. Silos may be made with any of the various building materials, and some very crudely and cheaply constructed have been found to do good service.

2. Silos may be above ground or under ground, or partly both; they should be water-tight, and preferably air-tight and frost-proof, although these two points are not essential.

3. The situation, form and construction of the silo, and the arrangements for filling, covering and emptying, should be largely governed by local condition.

4. Several small silos, independent or connecting, are better than one large one, and the depth should be considerably greater than the length, width or diameter.

5. Silos may be filled slowly or quickly, in all weathers, and heavily weighted or not weighted at all; the silage produced will vary in condition and quality, but these variations of management do not *very materially* affect the result.

6. Any plant or vegetable product, good for cattle food when green or fresh, may be preserved as silage, in an edible and succulent condition, throughout the year or for several years.

7. As a rule, all horses, mules, horned cattle and polled sheep, swine and poultry are fond of ensilage, if its material is ever such as eaten by them. Most farm animals prefer it to the best forage, and often prefer it to good roots.

8. The best time at which to cut any growing plant to make good ensilage is when the plant approaches maturity and is beginning to decrease in the percentage of its water content.

9. The cost of preserving a given crop as ensilage does not materially differ from curing the same crop by drying, in a suitable season; but crops can be ensiled and preserved in seasons when they would be lost if drying was attempted.

10. An acre of corn as silage will weigh four times as much as the same crop dried as fodder.

11. An acre of corn, field cured, stored in the most compact manner possible, will occupy a space eight to ten times as great as if in the form of ensilage.

12. The chemistry of the silo is still much in the dark. The contents of any one silo filled with crops from the same land, and apparently managed in the same way year after year, will differ in condition and quality in different years. Knowledge of the subject is not yet accurate enough to prescribe with certainty the procedure which will ensure the best silage. Yet any forage crop can be preserved in a moist, fresh form, substantially unimpaired as food, although there is generally a considerable loss in the carb-hydrate elements and a partially compensating gain both in the percentage of proteine and the increased digestibility of the fibre.

13. As food for cattle, as well as other kinds of farm stock, silage forms a good and very cheap substitute for roots, and its condimental effects are especially apparent. But the usual ensilage crops fail to fill the place of the root crop in a judicious farm rotation.

14. In feeding, the best results follow a moderate ration of silage rather than its entire substitution for dry, coarse fodder.

15. Silage, and especially good corn silage, when compared with dry corn fodder, or with other feeding stuffs, produces results so satisfactory as to surprise the chemist and which chemistry cannot yet explain.

16. A silo or two, well built but not too large or too expensive, are convenient and economical on most farms, to save crops which at times might otherwise be lost, if not to preserve some crop specially grown for silage.

17. The extensive use of ensilage upon any farm is chiefly a question of convenience and economy which local conditions must decide.

The advisability of a silo for any man cannot be decided by anybody not acquainted with the condition of the man and his farm. The economy of the system is one of its most important and yet most unreliable features. Every man must settle it for himself. Certainly, as a general rule, this system of ensilage applies to the places and general conditions where any of the forms and features of what we know, in these modern days, as intensive farming, are most applicable. If we go to Nebraska or Iowa and undertake to induce a farmer there to carry stable manure by the car-load from the city of Chicago to apply to his prairie land, which he is getting for a dollar and a quarter an acre, or even cheaper, perhaps, we are wasting our time and energy. Yet within fifty or sixty miles of New York a man that gives from fifty to a hundred and fifty dollars an acre for his land thinks, sometimes, that it is the cheapest thing he can do to buy horse manure at three or four or five dollars a cord in that city. The circumstances are entirely different. Circumstances govern the case. On broad acres and cheap lands, and where labor is very scarce, certainly intensive farming cannot be reasonably advocated; and soiling, for example, the feeding of green crops in summer time and keeping the animals in the stable, as well as the system of ensilage, which seems to be a sort of extension of the soiling system, does not apply. Its extensive use applies to places where land is dear, and where labor at least can be secured in sufficient amount, although it may be at a high price. On cheaper lands, or on abundant lands although not very cheap, where there is a scarcity of labor, where labor is necessarily distributed through the year and cannot be concentrated upon a great effort for a few days at a time, the system of ensilage does not apply so well. By that I do not mean to dispute what I have said before, that in a small way it can be advantageously applied on most farms, to supplement the ordinary rations of our domestic animals. Although we may have a plenty of bread and butter and of other ordinary food on our table, a root or two of celery, or a can of tomatoes helps out a meal wonderfully. They serve as an appetizer and help to digest and assimilate the other substantial food, of which we sometimes tire.

Now with this introduction, which I have made to cover even more time than I expected, I have endeavored to open the subject. I have here quite a mass of notes, the results of our own experience and that of others which I have been able to collect, which it would be impossible and unnecessary for me to read here seriatim, but which can be drawn upon at your pleasure. It was expected that I should here omit, or at least only name certain branches of this subject which you would wish to have followed further; and with your permission and that of your chairman I will now conclude the formal part of my remarks and enter into the conversational part of the meeting, gladly giving place, of course, at any moment to others who can also contribute from their experience to the subject we have under consideration. I am ready for any question that may be asked, and to give any additional facts or experience on any particular branch of the subject that may be called for.

Mr. Ira D. Sturgis, Augusta. I would like to ask if you have ever preserved ensilage without weighting it?

Maj. ALVORD. I have never had any personal observation through the year without weighting, but on the 18th of last month I went with Dr. Sturtevant, at the State Experiment Station, New York, into his silo, which had been filled with corn, a load at a time, never putting any in two days in succession, until he had got his usual depth; that was allowed to lie just in that condition till a month after the last layer had been put in, when the top was simply raked off and boards put on. It hadn't been disturbed from that time until we went into it in December. Upon removing the boards we found that three or four inches of the material on top was absolutely rotten; and then the next two or three inches of the material was slightly mouldy, and as acid as the strongest vinegar, although sound, apparently, and bright in color. When we got down eight inches we found quite an acid ensilage, but as good as I succeeded in making at any time during the first two years of my experience, with any amount of pressure. From within a foot of the surface downward the ensilage was as good as they produce in the silos that I have been acquainted with. In other words, the upper foot in thickness, of the material itself, seemed to be, in this instance, sufficient weight and cover for the rest; and of that foot one half was in an edible condition. This matter of pressure is one that has a wide range of experience and opinion. M. Goffart, who has had twenty-seven years' continuous experience in this matter, and has tried all sorts of methods, so far as weighting is concerned, from nothing to three hundred pounds to the square foot, gives it as his opinion that we should never use less than one hundred twenty pounds pressure to the square foot of surface cover, and that two hundred pounds is better. He has settled on about two hundred pounds to the square foot.

The cover should not be perfectly tight. There are two objects in covering and weighting: One is to prevent the outer air from working into the mass, and the other is to help to express the air that is in the material. Consequently, there must be a passage outward for the air to escape. The cover should not be allowed to come within an inch of the circumference of the silo; and rather than put on a double layer of boards with tarred paper between, to make a tight cover, I would simply lay plank half an inch or even an inch apart, as a bearing surface for the weight which goes on top of them; and then on top of them plenty of weight. It is almost impossible to get too much, although the weight is only needed for the upper four or five feet of ensilage, because that of itself affords a pressure of from two hundred to two hundred fifty pounds to the square foot upon all that is below it. So that, after all, you have only got to see to this upper five feet.

For weight, of course, my only advice to you is to use whatever is handiest. For a silo in a cellar the very best thing I have seen is to put empty kerosene barrels on top and fill them with water. They can be emptied with a syphon as fast as you want to relieve from weight, and there is no handling of heavy weight—bags of sand are sometimes used.

Dr. GARCELON, Lewiston. Will you please state in what form the ensilage is put into this silo—whether cut fine or not cut any?

Maj. ALVORD. The machine was gauged to cut three-eighths of an inch, but the machine does not run exactly true, and it looks like half-inch material.

Mr. STURGIS. Has it been your experience that there is any necessity for a water-tight silo?

Maj. ALVORD. Yes, I regard water-tightness as being essential to its success. The first and most important point about that is to prevent any water from getting into the pit, provided it is partly or wholly under ground, and it must be well drained around the pit, aside from the pit being water-tight, or water will almost certainly work into it at some season of the year. Then, secondly, water-tight in order to prevent any of the moisture from being expressed through the walls, as it will be in some cases, by putting in too moist material, or by this extreme weighting which I have recommended as advantageous. I think that the point of being water-tight, from without and from within, and more particularly from without, is very essential indeed. With a silo wholly above ground it would not be an essential feature.

Mr. STURGIS. Would there be any objection, when you put your corn in wet, to letting the liquid run out?

Maj. ALVORD. If I understand the question, it is very rare that liquid is found coming from the mass. Even when it is put in wet, that moisture is generally taken up by the mass. It would probably make a more acid ensilage than would otherwise result, but I have never seen liquid in the bottom of a silo that I was fully satisfied came from the material. I have never seen it in a silo that was above ground. I have always seen it in undergound silos, where I have been more than half convinced that the water came in from outside and not from the material in the pit. I make a single exception to this, and that is in the case of clover. From clover alone, especially cut clover, even if not put in wet, if it is stored above ground and there is considerable pressure put on, a very dark and extremely offensive liquid will generally flow at the bottom in greater or less quantity.

Sec. GILBERT. Is that the case when the clover has advanced to the stage of full growth?

Maj. ALVORD. I have always cut my clover for ensilage at the same time I cut it for hay, and I have never succeeded in getting it without this moisture at the bottom. But it appears to be perfectly palatable, although it is the nastiest and most stinking stuff that ever a man handled in the way of food.

Question. Do you cut your clover fine?

Maj. ALVORD. I cut it up the same as I do the corn. I have never had any success in preserving long forage, and I don't see any profit in it whatever.

Sec. GILBERT. What is the trouble?

Maj. ALVORD. The failure to exclude the air, first; and then you cannot get as much into your silo. If you have built a silo and paid for it by the cubic foot, as you must, it is a great pity not to use the whole of it, instead of using half. You put whole corn-stalks into a silo and then weight it, and when you have got it settled down your silo doesn't seem to be more than half full; and you have lost your expenditure to that extent. By cutting and packing well you can reduce the shrinkage to one-tenth. Then the next thing is in the feeding. I am so completely converted to cut feed that I cut all my forage short with the single exception of a part of the very best hay we have. So I should cut the ensilage when it came out if I did not when it went in, and I had a great deal rather cut it as it goes in.

Sec. GILBERT. How does the quality of the food compare, when it is put in whole and when it is cut?

Maj. ALVORD. I have never seen any that was put in whole as bright and free from acid as the same material put in cut.

Dr. S. OAKES, Auburn. When you put in clover whole do you get this dark liquid at the bottom?

Maj. ALVORD. I never have tried clover whole; but I have seen pits of whole clover with this same liquid in the bottom. I have tried it now four years cut, in greater or less quantities, and have never seen it without this liquid; whether it is put in dry or wet, we always find this liquid flowing from it, or in the bottom of the receptacle if tight.

Question. If the silo was built on top of the ground would not the ground absorb the liquid?

Maj. ALVORD. It would absorb it. The cattle will eat the clover that is saturated with it about as well as the rest. I have never found any spoiling of the silage until it was absolutely putrid, that would prevent stock from eating it. This question of sweet and sour ensilage does not seem to make any difference with the animal; they will eat an extremely acid material about as readily as one that is much less acid. In palatability there doesn't seem to be much difference.

Dr. OAKES. Is the acid any damage to the ensilage?

Maj. ALVORD. That goes into the ground of chemistry that I would rather let alone.

Question. What is the effect of the acid on the stock?

Maj. ALVORD. In moderate quantities, apparently no injurious effect. In the feeding experiments which are available to us, there appears to be no injury from an excessive amount of acid in their food. But of course all experiments have their time limited and do not answer the question whether a long-continued feeding of a very acid material will not injure the animal. You will find in the next report of the New York Station an account of giving milch cows five or six quarts of strong vinegar a day in their food with no apparent effect on their health, milk or butter.

Mr. W. W. HARRIS, Cumberland. Are we to understand that your idea is that an extremely acid food given to cows will have no injurious effect on the butter made from their milk?

Maj. ALVORD. I do not say that no amount of acid will injure the product. Perhaps I had better give that by reading the following account of an experiment:

"An experiment to test the effect of keeping a milch cow on acid corn ensilage alone."

"'Brownie,' a fair average cow, was selected from a milking herd of fifty natives. She was five and a half years old, weighed 847 pounds and had given about ten quarts of milk a day with her last calf. She was dried off in October and kept on hay alone until calving. That occurred on the first day of January, 1882, and from that time she was fed nothing but corn ensilage for a period of sixty-five days. The ensilage was the same as described in the last case—field corn. After several days' trial, sixty-four pounds was the quantity which it was found she would eat up clean daily. During the nine weeks the cow was on this diet her milk yield was thirteen pounds eight ounces per day, average, and rapidly declining after the fifty-fifth day. For the next thirty days she was given the same ration of sixty-four pounds ensilage, and, in addition, daily, five pounds of grain, viz: two pounds corn meal, two pounds wheat bran, and one pound cotton-seed meal. The milk yield of the cow averaged, during this month, seventeen pounds three ounces per day. Here was a daily gain of two quarts of milk at a cost of seven cents for the grain. The month of April having arrived, it was desired to try a change to dry feed before the pasturage season, so the ensilage was gradually cut off and dry forage substituted. In place of sixty-four pounds ensilage, the ration was twelve pounds cut corn-stalks and five pounds cut hay, with the same grain as in March. The milk record was then kept thirty days more, after the change had been fully made, and the average yield was eighteen pounds per day—on the last day, eighteen pounds four ounces. The ensilage ration cost seven cents, and the dry forage which replaced it a trifle over nine cents. The advance of the season may have had a slightly favorable effect upon the milk yield, but the cow was in a warm basement stable where the weather could not have much influence. Upon being turned out to grass in May, her product never reached nineteen pounds per day. During the four months' trial this cow had no exercise, and her water as well as her food was weighed, and amount consumed recorded. While fed ensilage alone she seldom drank oftener than once in two days, and averaged, for sixty-five days, nineteen pounds of water daily. [There were forty-six pounds more in her daily food.] The water consumed increased to twenty-one pounds a day when the grain was added, and to sixty-nine pounds a day after the entire change to dry food. The cow maintained a very even weight, during the trial, ranging from 840 pounds to 862 pounds. While receiving ensilage alone, an examination of the milk showed fourteen and a half per cent. cream volume, 3.85 per cent. of fat, and 12.67 per cent. total solids. The milk had, when fresh, a strong odor, plainly resembling that of the ensilage when taken from the silo, and a decided alcoholic flavor. One person who tasted it when warm, not knowing its source, mistook it for a milk punch, which, he said, was very good, but needed a little more sugar, and had not quite liquor enough in it; this taste and smell was very slightly perceptible in the cream, disappeared entirely when the latter became acid, and nothing unpleasant or unusual could be detected in the butter. It required twenty-six pounds of this ensilage milk to make a pound of butter. The butter was of good color and flavor, more resembling that from early pasturage than dry feed. This was in February. When, in April, the cow had only dry food, the butter lost its color and pleasant spring flavor, although at that time only twenty-three pounds of milk were required for one pound of butter. In this trial the best of ensilage was insufficient, used alone, to maintain the flow of a new milch cow, grain was added at a profit, and a change to dry forage increased the milk yield, but at a cost of over five cents per quart for the milk gained. The same amount of milk on ensilage and grain and on dry forage showed a saving in favor of the former of fifty cents a month in the cost of feeding the cow."

Experiments since instituted lead me to believe that most, if not all of the flavor and odor which I marked in that case had got into the milk from the air and not from the cow. The cow stood with her head within four to six feet of an opening into the silo, which was in a small barn basement, at least half of which was occupied by the silo, so that the air was confined. The exit to the floor above had been entirely cut off by transforming this barn basement partly into a silo. Not only the ensilage which she received, but all which was fed from that silo to twenty-five or thirty other animals was taken out there. So that the silo was open several hours a day, and the air of this basement in which the cow was kept was fully impregnated with the odor of the silo during the whole of the four months that she was being fed from the pit. It was never opened to be thoroughly aired. She was milked in that place. The milk was immediately carried out, of course, but still her milking required more or less time. Experiments which I have since instituted on purpose to determine how milk gets the various odors and flavors which it has, and especially the objectionable odors and flavors, have led me to believe that in this case the odor and the flavor which the warm milk had was obtained from the air and not from the cow.

Question. Wasn't the cow kept right in the same stall when she was fed on the dry food?

Maj. Alvord. Yes, kept right in the same place.

Question. And the milk didn't taste at all?

Maj. Alvord. The fact was that that cow "Brownie" had the very last of the ensilage that we had on the farm that year, and when we came to transfer her to dry feed the silo was entirely empty.

Dr. Garcelon. There was one point in connection with this experiment which I have not understood, and that is the influence which this feeding of ensilage had upon the flesh and weight of the cow. Was there any record made of the loss or gain in flesh during the time this trial was going on?

Maj. Alvord. This cow maintained a very even weight during the trial, ranging from 840 to 862 pounds. I have not the figures with me in detail in regard to that particular case. But that brings up another case of the effect of the feed on the weight of the animal, which I will read.

"No. 7. A trial was made to answer the question, Can young animals be maintained and grow on corn ensilage alone?"

"We did not care to try this experiment with valuable heifers, but selected two thrifty young bullocks, viz: a Swiss, born in April, 1882, and a Jersey, born in November, 1881. When the trial began, February first, 1883, they were respectively nine months and fourteen months old. They had been fed previously, during the winter, a rather poor quality of hay, and to each one and a half pounds wheat bran and one-half pound cottonseed meal daily (two pounds of grain food and hay *ad libitum*). They weighed, November 1, 1882, the Swiss 372 pounds; the Jersey 540 pounds. They weighed, February 1, 1883, the Swiss 415 pounds; the Jersey 600 pounds. It required over two weeks to change their diet to ensilage alone and get them to regularly eating it. This was accomplished so they began recorded ensilage rations on February 17th. They then weighed, the Swiss 412 pounds; the Jersey 575 pounds.

"Forty days' regular feeding of ensilage alone then followed; the rations being, for the Swiss thirty-six pounds per day, for the Jersey forty-six pounds per day. They sometimes rejected a portion, which was always weighed. The net result shows an average consumption of thirty-four pounds three ounces for the Swiss, and forty-three pounds eight ounces for the Jersey.

"PERIODICAL WEIGHINGS.

Animals.	Dates.						Forty Days.
	Feb. 17.	Feb. 24.	Mar. 3.	Mar. 10.	Mar. 17.	Mar. 28.	
Swiss..........	412	415	420	410	410	410	Loss, 2 lbs.
Jersey	575	555	572½	575	572½	580	Gain, 5 "

"We have here substantially maintenance rations for these animals, fixed but not growing rations; say thirty-four and a half and forty-three and a half pounds, respectively, costing less than ten cents per day for the two. Although offered water twice daily, neither animal has tasted it for forty days and more."

W. H. Deering, Saco. Do you feed your ensilage fresh, or do you use salt?

Maj. Alvord. I feed it fresh. The salt is always available for all of our stock.

AFTERNOON.

Question. What is the best size of silo capable of holding five or six acres of corn?

Maj. Alvord. In the first place the silo must be built to hold as much corn as can be got from five or six acres—not a minimum crop, but the maximum crop. I put the maximum crop at twenty-five tons to the acre, because I do not believe many men will get more than that from a piece of five or six acres. We hear talk about forty, fifty and even sixty tons of corn to the acre, and I have been endeavoring for a long time to see such statements proven, but I have not succeeded. I do not believe forty tons was ever raised on an acre. I do not believe that thirty tons to the acre can be relied upon. I have never succeeded in getting over twenty-seven. Make it twenty feet deep, which is a very good depth. and twenty feet long and fifteen wide, and it will hold six thousand cubic feet. If you succeed in getting this one hundred and fifty tons from six acres you will do extremely well. You probably will not get more than one hùndred tons off from six acres once out of five years. If a man gets twenty tons of corn off from an acre of land he is doing pretty well.

A Farmer. I would like to ask Major Alvord which is the best part of the corn, the stalk or the leaf; in other words, which we should seek to grow, stalk or leaf, in raising corn for ensilage?

Maj. Alvord. I do not think that the different parts of the corn plant have been as accurately studied as they should be to enable a proper answer to that question. But so far as I have studied them and practiced with them, I have satisfied myself that for horses, mules, sheep and milch cows, the corn blades, the leaves of the plant, properly cured, are equal pound for pound to the very best of our hay. And next to that the top fodder or the whole of the plant above the ear would range in value for feeding purposes. That simply means that the stalk is the least profitable to raise. Hence I think we ought to endeavor to get growth of blade or leaf rather than to plant as thickly as to get great length of stalk rather than abundance of blade. That is borne out I think by the experience of those who have tried crops grown in the different ways as to their feeding value. I think when you give the plant room enough and sun and air enough to form a symetrical plant, to develop its leaves to the fullest extent, you get a better feeding product than when you crowd it. If you go anywhere south of the Potomac you will find big corn grown, only one kernel in a hill, and the hills four feet apart, and yet they will produce as much weight per acre of dry fodder in that way as we can from our thick seeding here in the North. I do not think that any of us except old soldiers and travelers who have seen the corn plant growing in the river bottoms of Virginia and Kentucky appreciate what a plant a single stalk of indian corn may be. It is an entirely different article from what we see when they are crowded together.

Allow me, in connection with what has been stated, to read a note under my heading of "Crops for Silage—Corn."

"The plant should approach maturity, the ears be well formed, if not glazed before cutting. Allow it to wilt from one to ten hours, according to the weather, to reduce the proportion of water to solids, before storing in the silo, whether it be whole or cut. Seventy-five per cent of water is enough for the best silage. Cultivate in drills, two to three and a half feet apart, according to the size of the plant, and let the plants be two to three inches apart in the drill. Let the land be clean and in the best of mechanical condition. Manure heavily with barn-yard manure, broadcast or in the drills. If it is green it should be plowed under shallow; if well composted it should be harrowed in after plowing. Add superphosphate in the drills to give a start. It is economy to feed generously, crowd the growth and secure the greatest possible product per acre. Commercial fertilizer alone, even if largely used, will not grow good corn; animal manures are necessary to satisfactory results. Crops of from twenty to thirty tons of green fodder, and hence twenty to thirty tons of ensilage per acre are often obtained. Over thirty tons are rarely produced; and the average is below twenty tons rather than above it. John Gould of Ohio reports twenty-three tons of corn ensilage per acre from eleven acres, and that this, with the yield of five acres of field corn and one ton of wheat "shorts," kept fifty-four head of cattle and three horses through the winter. The field corn was fed as cob meal and its fodder dry. This herd was milked all winter and exceeded, in pounds per head, the milk product of any other herd contributing to the neighborhood butter factory. The milk was regarded as of the highest quality. He further says he has neighbors who have produced on twelve acres as much corn silage as is equivalent to the usual hay crop on the same farms, from 200 acres of average Ohio meadow land."

The following written question was then read by the chairman: "Yellow corn fodder;" have you any knowledge of its being used for ensilage, when grown for grain?

Maj. ALVORD. Yes, I have. An excellent dairyman in the State of Vermont, a man whose butter in the Boston market has for years sold above the average market price, whom I know very well and have frequently met at the Vermont Dairymen's Meeting, grows his corn in that way. He uses the eight-row yellow corn. He plucks the ears from the stalk when it is in the milk, throws them down in the field in piles, each of which contains two or three baskets of corn ears. There he leaves the corn and immediately cuts the fodder and makes ensilage of it. The crop at that time has not more than 75 per cent of water, hardly as much as that. He leaves his ears of corn on the ground, stirring them now and then. He gets one hundred bushels of ears of corn and six to eight tons of good ensilage per acre, and gets better ensilage than he has ever got in any other way. He says it is not a great deal of work. That is one case that I know of, and I have heard of several other cases where it has been tried with equally good results, although I have not a personal acquaintance with the men.

Sec. GILBERT read the following written question: What have you to say with regard to experiments to determine the comparative feeding value of ensilage and of dry fodder from the same material?

Maj. ALVORD. I will read.

"Errors have arisen from comparing corn ensilage with hay, straw and other kinds of food. No such comparison can be justly made, or at least not until ensilage as a food has a more even quality so that a standard may be fixed for it. With the present knowledge of the subject, the primary question is as to the effect of this process upon any forage plant thus preserved. What is the feeding value of rye or clover, as ensilage, compared with the same plant in its growing state, or cured as hay? Like wise corn ensilage must be compared with the green maize, cured corn fodder, or stover and grain.

"With this view of the subject, some comparative trials have been conducted under my supervision, in the experiment department of Houghton Farm, the results of one of which will now be given.

"An experiment to ascertain roughly which would hold out the better in feeding corn and its fodder, field cured, or the matured plant as ensilage.

"In a field of ten acres of growing corn, cultivated in hills, two acres were selected and marked off, as nearly equal as possible, even to counting of vacant hills. The corn from one acre was ensiloed in September, when the grain was just beginning to glaze, and the next week the crop was cut on the other acre, field cured, and later it was stored under cover, the corn being husked. The crop from one acre weighed 18,910 pounds when put into the silo, nine and a half tons of ensilage. The harvested crop of the other acre consisted of 3,027 pounds of corn (ears) and 2,982 pounds of stalks, or three tons of dry food. Half the product of each acre was fed to a cow selected for the purpose, the two cows being as evenly matched as possible. The one receiving ensilage was given all she would eat for a week, and the daily allowance based on this trial, then regulated so as to average seventy-four pounds per day, until the supply was exhausted. The half-acre crop, as ensilage, lasted one hundred and twenty-six days. The other cow was given a fixed daily ration of twelve pounds each of cut stalks and cob meal; the half-acre crop lasted one hundred and twenty-four days. There was no more waste in the one case than in the other. Both cows fell off rapidly in their milk, although the one on dry feed did rather the better. Their milk record is regarded as of no value, experimentally, as individual peculiarities might account for all the difference; a single animal only being in use, the margin for error is too great to make any comparison safe. The crop was a light one—more ensilage might be produced on an acre—so might stalks and corn. But taking the equal acres as they stood, their products, preserved in the different ways, lasted equally well. Neither cow was fed well enough for an animal in milk. What each one received per day and what they ought to have had, according to chemical examinations of the food, the following table exhibits:

Food Elements.	Pounds of Dry Food.	Protein, pounds.	Fat, pounds.	Nitrogen, free extract, crude fibre and ash, lbs.
In standard ration	21.50	2.25	.50	11.25
In 74 pounds corn ensilage......	17.95	1.362	.575	13.35
In 12 lbs. each stalks and cob meal	19.34	1.438	.526	16.83

"The dry ration seems to have given rather greater nutritive value than the other, yet the difference may have been made up by greater digestibility in the succulent material."

I would like to ask Prof. Jordan what he thinks about the effect on the digestibility of the corn through the process of ensiloing.

Prof. Jordan, Director of Experiment Station. I have only one or two things to judge from in the matter. The Germans have performed some digestion experiments with sour beet leaves and also with sour hay, that is, hay that has fermented in a manner similar to the fermentation of the ensilage, and I am very certain that the result of the experiments was that digestibility was not increased by the fermentation. And we have no data to show that by the process of ensiling the digestibility is increased, even of the crude fibre.

Maj. ALVORD. This is a matter of opinion formed by myself from observation in feeding green corn, corn fodder and ensilage. A cow, apparently under the same conditions, will eat a great deal more weight of corn cut directly from the field, than she will of ensilage, without any better effect upon her body or her products. This is a matter of observation of my own. I settled it, even in the case of grass, for myself, a good many years ago in determining the relative quantity of hay and grass that a cow would eat, and also of corn in its different forms. And M. Goffart states that in the silo the material "undergoes a commencement of decomposition which facilitates digestion and increases the nutritive and assimilative power."

Sec. GILBERT. How does clover ensilage compare in feeding value with clover hay?

Maj. ALVORD. I do not know of any comparison whatever.

Sec. GILBERT. Have you any data with regard to corn?

Maj. ALVORD. I have something here which I will read.

"A careful trial of corn ensilage as the principal food of dairy cows, compared with usual winter diet of dry forage, mainly corn fodder.

"Two sets, with eight Jersey cows in each, were selected from a milking herd, the greatest care being taken to match the animals, two and two, rather than collectively, as to breeding, age, weight, period of calving, length of time in calf, and feeding and milking qualities, the daily record of all being accessible for more than a year previous. During the trial, when one cow was a little sick and did not eat well, she and her mate in the opposite set were both removed, and an accident vitiated the record of another, removing two more, so that the final record is that of six cows on a side, or six pairs of cows.

"Every effort was thus made to remove the liability to error arising from individual peculiarities—a very important point in connection with any feeding experiment. These twelve cows were fed and treated alike for a fortnight prior to beginning the record, and then for twelve weeks their treatment was exactly the same, except that one set of six (Lot A) received only corn ensilage besides grain, while the other set (Lot B) had dry forage only. The uniform grain ration was a mixture of four pounds corn meal, four pounds wheat bran, and one and one-half pounds cottonseed meal, fed in two portions. Lot 'A' received sixty pounds ensilage per day, it being of average quality as per analysis given later in this paper, and Lot 'B' received twelve pounds of cut stover and five pounds cut meadow hay per head daily. The coarse forage in both cases was given in two portions, one separate from the grain, the other a mixed feed. The following is the milk record of the two lots, for the twelve weeks' trial:

Six Jersey Cows.	Pounds milk per week at beginning trial.	Pounds milk per week at close of trial.	Average we'kly milk yield, pounds.	Average for 12 weeks per day and per cow, pounds.
Lot A—Ensilage...	825 lbs., 2 ozs.	731 lbs., 12 ozs.	774 lbs., 10 ozs.	18 lbs., 7 ozs.
Lot B—Dry feed...	816 lbs., 6 ozs.	722 lbs , 14 ozs.	781 lbs., 8 ozs.	18 lbs., 10 ozs.

The periodic loss or shrinkage of milk for every division of four weeks, comparing the quantity on the first and last days of these divisions, was as follows, the sign (+) being for gain, and (—) for loss:

Cows.	January.	February.	March.	Total, 12 weeks.
Lot A.......	—60 lbs., 2 ozs.	—8 lbs., 3 ozs.	—25 lbs.	93 lbs., 5 ozs.
Lot B.......	+1 lb.	—24 lbs., 9 ozs.	—70 lbs., 6 ozs.	93 lbs., 15 ozs.

"Here the ensilage-fed cows showed the greatest falling off in milk yield at first, but less at the end, thus holding out as well as the others. As to the quality of the milk from the two lots, these facts were ascertained, the figures being the average of numerous tests, physical, chemical and practical:

Six Cows as Before, Jerseys.	Specific gravity.	Total solids in 100 pounds milk.	Fat in 100 pounds milk.	Cream volume per cent of the milk.	Pounds of milk to one pound of butter.
Lot A	1032	14.16 lbs.	3 95 lbs.	20½	22.9
Lot B	1029	13.81 lbs.	3.93 lbs.	18	20.2

"It should be noted that although the ensilage milk gave more cream, the other produced more butter. The butter from the milk of Lot 'A' was decidedly better than that from 'B' in both color and flavor.

"Lot 'A' drank an average of twenty-five pounds per day per head, of water, often drinking but once in three days and rarely twice a day. Lot 'B' seldom failed to drink twice a day, and averaged seventy-six pounds six ounces water daily, per head. The weights of the different animals varied from time to time, but there was no material difference in the two lots.

"In April the ensilage was discontinued and Lot 'A' changed to the same ration as Lot 'B.' After one week's intermission the two were compared for four weeks longer, with this result:

"Lot 'A'—687 pounds 2 ounces per week; 16 pounds 6 ounces per day and per cow.

"Lot 'B'—702 pounds 2 ounces per week; 16 pounds 11 ounces per day and per cow.

"All through this trial the results are very even, and although on the average the dry ration seems to give a little the better product, the difference is not enough to exceed the limit of error. With quantity slightly against the ensilage, the quality was in its favor. It may be fairly called a drawn game."

Sec. GILBERT. Have you known of other experiments besides your own in that direction?

Maj. ALVORD. I have known of some others. There was a trial of a similar character which was going on at this same time, although unknown to me at the time, at the New Jersey State Experiment Station, under Dr. George H. Cook, with his assistant, Mr. A. T. Neal, whom I regard as about as judicious and practical a pair of investigators and experimenters as we have in the country. The result was published in a bulletin of the New York State Experiment Station in 1884, if I am not mistaken. I am afraid I haven't the figures here; but the main point to me was that their results were entirely corroborative of my own, and generally we reached the same conclusion—practically the same outcome. And there are others of a similar character that I do not place so much reliance on.

Prof. JORDAN. I would like to state a question in the form of a problem. I think it will be admitted that the cost of preserving cattle food by drying and putting into a silo are practically the same. There will be no difference there. Now, I want to ask two questions in that connection. Would the gentleman put into a silo crops that can be well cured by the ordinary drying method? If not, does corn fodder when sown in drills produce a larger amount of nutritive material per acre with the same cost, or the same amount with less cost, than other grasses, so as to make it an object to raise that and put it into a silo because we cannot cure it in any other way?

Maj. ALVORD. The question involves several answers, rather than one. In the first place, without stopping to give any figures, but merely stating the result of my experience and that of numerous others whom I have endeavored to get close figures from, I should say that the cost of harvesting is about the same, with an ordinary crop and with ordinarily good weather, whether it be put into the silo or cured dry—field cured. Of course in bad weather, with the delays and interruptions, the cost of field curing increases. Then next is the question of production upon equal areas. That, I think, has to be answered conditionally. There is some land, unquestionably, where you can grow excellent crops of corn, where grass will not grow, no matter how you treat it. There is the place to raise corn. But if you go onto a farm where there is good grass land, and perhaps equally good corn land, and if the land is already in grass, I should hesitate very much, from the experience I have had about recommending the breaking up of a good sod for the purpose of substituting ensilage corn, expecting to get more food from the same area, provided the arrangements of the farm were such that the curing and storing of the hay crop could be comfortably done while the introduction of the new system would involve an outlay, to start with, to change the buildings and appliances, and probably additional outlay for labor at certain times of the year, notably at the time of the storing of the ensilage. And then I should go a little beyond that and say that very much depends upon what actually is the feeding value of good corn ensilage, as compared with other crops which can be raised and cured dry on the same land. Take the hay crop, if you please; there is a place where there is a very great difference of opinion. I started out four or five years ago with the belief that a ton of ordinarily good hay was worth, for my purposes, in the care of dairy stock, at least five tons of corn ensilage. But since that time I have made a great deal better ensilage and have had better results from feeding it; and I have lost two hay crops out of five, while I secured corn good enough to put into ensilage both years. So that my faith is shaken; and as to the ratio, I now consider that if I have my choice I will store three tons of real good ensilage in preference to one ton of hay. Now, if we take the other basis, five tons of ensilage to one ton of hay, then I say that, with the same labor and the same manure, on an acre of good grass land, I can grow as much food in the form of hay as I can in the form of fodder corn. But if we take it at the ratio of three tons of ensilage to a ton of hay, then with the same labor and the same manure there is very little land, if any, where the corn crop will not beat the grass crop. Now we have got to go a little further yet, and suppose the case of a farmer who has convinced himself that he can get, with his labor and with his home arrangements, as economically, as much feed for his herd from his land in grass, or in crops to be cured dry, as he can in ensilage, and therefore he hesitates about using the silo. I should say to that man, if you are in the habit of wintering milk-producing animals, in which I include ewes in milk, and are not in the habit of raising a root crop, then you can afford to build a small silo and put up ensilage enough to give every animal you have a green bite, and a pretty good one, throughout the season when they are not at pasture. And moreover I am inclined to say that such a man cannot afford not to do it if he means to keep up with the times.

Mr. Sturgis. Have you had any experience in comparing the value of roots and ensilage?

Maj. Alvord. Yes, I have some figures here on that point, though more particularly with sheep than with cattle. I have not been feeding very much root fodder to my cows of late years, and I am afraid I haven't anything here in the way of figures on that point. But I would say generally, that we find our milch cows and our ewes in milk will generally prefer ensilage, if it is good, to roots, with the single exception of sugar beets; my cows and my ewes prefer sugar beets. But they prefer ensilage to turnips, Swedes or Mangels. In results we find that in the production of milk, and the value of that milk for butter, the ensilage does as well as the roots. In other words, the effect on the animal seems to be that of a condiment; it has a hygienic effect rather than contributing so much to the food which they transform into their products, and this effect of a succulent crop in the form of a condiment seems to be just as good in the shape of ensilage as in the shape of roots. But in the case of raising early lambs for the market, where not only the milk product but the way in which that milk was used was taken into consideration, we found this result last winter in a comparative test between roots and ensilage fed out to two batches of ewes with lambs. The lambs whose mothers were fed ensilage apparently exceeded in growth, appearance and thriftiness the corresponding pen of lambs whose mothers were fed sugar beets, although when the trial commenced the different pens were matched as exactly as it was possible by a draft on three hundred breeding ewes. And when we thought those lambs were ready to sell in the market the buyers who examined them, and went into the aisle in our sheep barn, with the pens on either side, always got over into the silage pen first to examine those lambs, thinking they were the best lambs. But the result was that the butchers refused to take the ensilage-fed lambs till a good while after I had had numerous offers for those whose mothers had been fed on beets. They claimed that the lambs were not as well filled up, were not in as good butchering condition when their mothers were fed on ensilage as when they were fed on beets. And that I verified later by dressing one from each pen myself, when I found the difference very marked. The lambs in the ensilage pen weighed more, but they were not in marketable condition; they were not fat; and I attributed that to the acidity of their mothers' food in place of the sugary character of the juices of the beets which the others got.

J. R. LEARNED, Auburn. You have spoken of the comparative value of roots and ensilage. How about the comparative labor and expense of raising and storing?

Maj. ALVORD. We may not have the best of root land, although in the habit of raising roots. We formed that habit before the days of ensilage and are sort of holding onto it from long association and custom. The best roots cost just about three times as much, ton for ton, as ensilage. I have been unable to put sugar beets into our cellars at much less than six dollars a ton; I have been willing that they should cost five dollars a ton, which is a sort of a standard price for sugar beets, or used to be, in Maine, Massachusetts, and in New York. I don't know as they are worth it. I think one year I got so large a crop that it brought the cost down to five dollars a ton. At any rate I am perfectly willing to raise them for the market for that if I can get the pulp back, because I think the pulp is as good as the whole beet for feeding purposes. We haven't been able to raise them at much less than six dollars a ton on the average. Our ensilage rarely costs us over two dollars a ton. So we may say the roots cost from two to three times as much as the ensilage. And with this single exception that I have given, the raising fat lambs for early market, have not found any place where the ensilage will not quite replace the roots as a food. I have been interested, in that connection, to examine our standard chemical formulas for roots and ensilage, and I have here before me a table giving the chemistry of four different roots and also an analysis of very fair corn ensilage, which I will give you.

	Total dry matter.	Water in 100 lbs.	Protein.	Fat.	Nitrogen, free ext'ct.	Crude fibre.	Ash.
Ledon's, H. F., sample (corn), 1884..........	16.65	83 35	2.28	.23	8.42	4.29	1.43
4 roots for comparison } Average..........		87.52	1.55	.20	8.72	1.10	0.98
Mangolds....................		92.10	1.80	.40	4.40	0.80	1.00
Sugar beets....................		83 90	2.10	.10	11.70	1.10	1.00
Swedes....................		87.00	1.30	.10	9.50	1.10	1.00
Carrots....................		87.10	1.00	.20	9.30	1.40	0.90

So that, take it all in all, our analysis of good corn ensilage shows it to be a better food, chemically, than the average of Mangolds, Sugar beets, Swedes and carrots.

Prof. JORDAN. What is the comparative cost of producing a ton of hay and a ton of ensilage?

Maj. ALVORD. I presume there are men here who have tried that. I have some figures, but they are not satisfactory to myself, and I should not want to give them.

Sec. GILBERT. I suppose it is not best to work our speaker to death, because we want him to do some more good in the world, and it may be well for him to rest a minute here. The question is raised as to the cost of a ton of hay. That matter was investigated last year by the State Board of Agriculture at an Institute held at Saco, as critically as we were able to do it, and a report of the same may be found in the Report for 1884. We drew upon the best material we could find from one end of the State to the other, and considered it from several standpoints. The conclusion was that the cost varies widely under the different systems of farming. If hay is raised for the purpose of selling it from the farm, and the fertility is replaced on the farm so as to keep up its production, then the hay is quite an expensive article. According to the best estimates we could get, drawn from practice, the cost is about twelve dollars per ton. Under a system of rotation and feeding out on the farm, so that you have the resulting manure without cost save that of application, the cost of a ton of hay is reduced to about five dollars per ton, under good practice and on good grass soils. That was the summary of the two extremes. Under different crop systems in connection with the production of hay, it varied between those two figures according to what the crops were. It is, however, a somewhat complicated question and involves a great many considerations, and these figures had better be taken with something of allowance, and called an approximation of the actual cost of hay.

Maj. ALVORD. Secretary Gilbert has stated, in answer to the question of Prof. Jordan as to the cost of a ton of hay, that it varies, according to its uses, apparently, from five to twelve dollars in this State. I have no doubt that ensilage can be put into the pit in this State at about the same cost as anywhere else. It varies with the facilities for putting it in. I have cast up a very large number of statements of the cost of corn ensilage in different parts of the country, and have reached an average of $2.10 per ton, including

I presume—this being an exhaustive examination—the same items that would be included in the estimate of the cost of a ton of hay. That is for ensilage that is ready to feed, just as it is for the hay. Four-fifths of the ensilage being water—provided it is water and nothing else, which we are not so sure of—we find that the dry food in the ensilage costs ten dollars a ton. But we are by no means sure that this four tons of water which we are handling with every five tons of ensilage is not worth something more than water in the stomach of a cow. The cow generally says it is. The cost of harvesting, on the other hand, varies very widely indeed, and I have figures all the way from ten cents to a dollar a ton as showing the cost of harvesting a ton of ensilage. These figures are more or less uncertain, because some men will say "that is what it cost me," when they mean that they had to spend so much, and do not count in their own time or labor. Smith & Powell had eighteen tons per acre and give the cost of cultivation at fifty cents per ton, and the cost of harvesting at eighty-seven cents per ton, making one dollar and thirty-seven cents from the time the seed is planted until the ensilage is ready to eat. That is a very careful computation of business men who know where every dollar goes. As near as I can get at it, two dollars a ton for the ensilage, or ten dollars a ton for the dry food of the ensilage, is about the average.

Question. What is the amount of water in our hay?

Prof. JORDAN. Ten to fourteen per cent, after the hay has been in the barn awhile.

J. R. LEARNED. What do you allow for cutting the ensilage into three-eighth-inch lengths?

Maj. ALVORD. My recollection is twenty cents a ton.

J. R. LEARNED. We claim in this vicinity that we can save that, and have better ensilage whole than if it were cut.

Dr. S. OAKES, Auburn. I would like to know whether in your opinion it would be advisable for small farmers to put in a silo?

Maj. ALVORD. Of course this is a pretty serious question to ask, because there are so many things to be taken into consideration.

It is pretty dangerous business to give general advice. I should hesitate to say more in answer to this question than to say what I have already said, that I think, generally speaking, a man who has domestic stock giving milk between the failure of grass and the springing of grass will find the silo a profitable investment. And I would go so far as to say that any one who has any number of domestic animals which he has got to keep over from fall to spring, and from which he desires to get growth of bone and muscle, I think will find a reasonable sized silo, adapted to his place and his stock, economically built, properly handled, a profitable investment. If he had a silo on his place I should not have the slightest hesitation in saying that it would be to his profit to fill it.

Mr. STURGIS. I have been very much interested in this discussion. We want all the information we can get in this matter, especially from Maine men who can tell about how things go here. I have never lived in New York, Pennsylvania or Connecticut, but I have visited silos in all those States. I only want to give you my experience, as I am always glad to get the experience of others. I have a silo. I commenced it six years ago. Previous to that I raised from four to six thousand bushels of roots a year. I keep on my farm from 250 to 500 sheep and quite a large number of cattle and hogs. I have got the best ensilage this year that I have ever had. My corn this year and last year has been sweet corn. I cut it when the ears were about ready to be taken off to go to the corn factory. It stood then from eight to twelve feet high. I put in about one hundred and sixty-five tons. I do not entertain the idea that you can feed stock on it exclusively. The rule I have adopted is to give my cattle one foddering of ensilage a day, about thirty pounds. At about three o'clock in the afternoon I give them two or three quarts, perhaps, of some kind of feed, meal, shorts, or something of the kind, and at night hay. It costs me about forty cents a ton to cut my ensilage and put it into my silo. I wish to say to you one thing in particular, never put corn in whole. My cutter is set to cut one-eighth of an inch. At first we thought it was necessary to hurry about it, but we have found that it is not. You can take your entire farm crew and put it in as you can. When I get my ensilage into my silo I cover it over a foot and a half deep with oat straw. Then I lay plank on that, close together, and put on about seventy-five tons of stone. My silo is 35 by 15, and about 15 or 16 feet high. You cannot find a spot in my silo that is damaged below the straw. It is as bright in one spot as in another.

Maj. ALVORD. In what condition do you find the straw?

Mr. STURGIS. It is almost rotten.

Mr. ALVORD. What is the object of putting straw on there to spoil?

Mr. STURGIS. When I have not put it on I have found my corn rotten at the top for from four to six inches, and by putting the straw on I don't get any rotten corn. I believe in putting on a pretty good weight.

I am satisfied that, fed to my stock in the way I have stated, three tons of ensilage is worth a ton of as good hay as I ever had in my barn. This year on six acres I raised about 165 tons. This piece of ground had not been plowed for twelve years.

Question. Why would you not put your corn into your silo whole?

Mr. STURGIS. In the first place you cannot get in anywhere near the amount that you can where it is cut; and then it is very difficult to get it out; and the mass is not so solid and compact, and it will not keep so well.

Maj. ALVORD. This matter of cutting has perhaps been spoken of to-day in rather too much of a joking way. My preference is for cutting, as I have said before, because I like to feed everything to my animals short, except some of my very best hay which I know they will eat up clean. I like to feed short for the convenience in handling when I feed and for the convenience in handling the manure in case there is any waste. I cut my bedding just as short as I do my feed. I believe there is economy in it if it can be done by horse power. I have never known a week in the winter time when a horse was not idle for a sufficient length of time to allow me to get pretty well ahead in the cutting of my feed and bedding, so I can always keep plenty on hand without any apparent expense for the labor of cutting. I should not attempt to do it by hand power. Then there is another reason, which I have before mentioned—that you cannot get as much into your silo in the whole state as when it is cut, and you must build a larger silo in order to get an equal amount of feed into it. So I believe it is really more economical to cut it. I should want to cut it before it was fed, anyway, and it is more economical to cut it at harvest time than when it is taken out of the pit. It is very awkward and unpleasant stuff to handle when taken out long.

Sec. GILBERT. How about the degree of fermentation?

Maj. ALVORD. There is a different point. Of course the corn plant is made up of cells, and those cells hold more or less air, and it is because you want to express the air from the corn plant and, secondly, from the whole mass, that you cut the corn while it is in the succulent state. If it wasn't for that you could make ensilage from rye straw just as well as from the green plant. The cells will not press after the plant is hardened as they will when it is in the succulent state. I have seen ensilage made from rye straw cut short and water added to it. It made very fair feeding stuff and it was all eaten up, but it wasn't a success; the air wasn't expelled. It is claimed that if you cut your material short you then have a very much better opportunity to express the air and consequently to control fermentation. On the other hand, those in favor of long fodder put into the silo claim that when you cut it up you give an opportunity for the air to enter the cells of the plant before you can get it in and put on your weight; that a greater number of cut ends are exposed to the air, and that the fermentation consequently is increased rather than retarded. But, from my examination of silos where both processes have been followed, my belief is that the fermentation can be very much sooner checked and much better regulated with cut material than with uncut. That is really the best reason, in my own opinion, for cutting it.

J. R. Learned. I am afraid you will think I have got some patent to sell on long ensilage; but I have not. Any information that can be given to the farmers in this locality that will improve our practice here in Maine and in Androscoggin County will be gladly received, I know, by all. But what will do for Massachusetts or New York may not be the thing for this locality. If we must cut our ensilage we must either own a horse power or a steam engine and a cutter, which is quite expensive, or we must depend upon our neighbor for this power and this cutter. Our neighbor is just as anxious as we are to get his corn in before the frost shall reach it, and we must take our turn.

I say, on account of economy of labor, it is better to put ensilage in whole. Last year, in an article which I read before an ensilage meeting, I claimed that there was not economy of room in cutting the ensilage; and my experience is that whole ensilage certainly will take no more room than cut ensilage. By taking a stalk of corn and cutting it up into bits three-eighths of an inch in length you make that corn occupy more space than the whole stalk would occupy. You cut your corn in bundles, binding them with strings or with tops of corn, and keep your stalks all straight, and when you place them in the silo begin at one end and place the butts against it and then shingle them down across the silo, and then reverse your work. I am satisfied that you can get as much whole clover into a silo as of that which is cut with an ensilage cutter.

It is the easiest thing in the world to take it out; in my opinion much easier than the cut. You begin and uncover only one section of the silo, and take an ordinary hay knife and cut it down. My stock eat the whole corn very readily, leaving perhaps two or three bushels of butts during the winter. My corn grows ten or twelve feet high and as large as my wrist, but the butts are nearly all eaten. I don't think you could go into my barn and find a bushel basket full of waste. This is my argument. I have no patent to present to you; I simply tell you what I believe is the best way for us to use the silo. With my experience of three years I am satisfied that whole ensilage will keep as well, that you can get as much into the silo, and with very much less labor and expense.

For two years I have cut my second crop of clover and put it into my silo at the same time with my corn. The first year I cut my first crop of clover and put it into my silo and weighted it, and then when I was ready to put in my corn I uncovered my clover and put my corn in on top. Of my second-crop clover I cut about forty tons from a piece near my barn, about the last of August, and put it in with my corn. There is no danger in mixing a load of corn with a load of clover; the weights will bring it all even. That second-crop clover which I put into my silo came out as nice feed as I ever wish to use. So I say the silo for corn and clover is just the thing, because it is sure to make good feed.

Question. How much corn do you ever raise to the acre?

J. R. LEARNED. I cannot tell you exactly. My opinion is that we over-estimate the weight. I think twenty tons to the acre is a large yield.

NELSON HAM. Does the mixing of the clover with the corn make any perceptible difference in the flavor or appearance of the corn?

J. R. LEARNED. I see no difference. In going into my silo you will see a layer of corn and a layer of clover, and as I was hauling my sweet corn to market I would haul home a load of cobs and put them into the silo, and you can see layers of them.

Prof. JORDAN. There is one point that has been overlooked in this discussion as to filling with whole or cut material, and that is the difference in the destruction of material by fermentation. Destruction of material occurs in the same way that it does when you burn wood. Dry material is burned up. In some experiments as to the relative amount of material destroyed by loose filling and compact filling, I found that when the corn was cut finely, packed as closely as possible and weighted at once, the loss of dry matter was ten per cent; while when the corn was packed gradually and loosely the fermentation increased and the temperature increased and the loss was twenty per cent, or one-fifth of the dry material. All of this loss in both cases was sugar. And the same thing will take place, to a certain extent, if the silo is filled with whole material, because it cannot be packed so closely, and there will be an increase of fermentation.

Maj. ALVORD. There is a point about the cover that ought to be mentioned in this connection, in respect to what was said by Mr. Sturgis. It is simply a question of which is the most valuable in the place where it is used. I could not afford to put on straw to save my corn, because the straw would be worth more than the corn. At the top there will probably be more or less loss of the ensilage unless you have something for a cover. I have been assured by two or three persons who have tried it, that by the use of green hemlock boards for a cover they had absolutely no loss of material at the top. This was from men of close observation who do not pretend to give any reason for it. They said that when they used dry hemlock boards as a cover for the same silo the material immediately under it was spoiled.

Question. Should these covering boards be laid closely together?

Maj. ALVORD. I do not lay them very closely together; I leave a space for the air to escape between them.

C. H. COBB. In this county there are some twenty or thirty silos in use this year. A portion of them when opened in November, open warm and remain so throughout; while others, when first opened, are cold and remain so till all fed out. At this time I rise to ask the speaker to explain the reason of this. Even in the same barn where there are two silos, one of them when opened will be warm and remain so and the other will be cold and remain so.

Maj. ALVORD. It is one of those cases that you have got to know a good deal more about than I do in order to give an opinion that would be worth anything.

Question. Which is best, where it comes out warm or cold?

Maj. Alvord. I think it ought to come out cool. But it always warms up if you leave it twenty-four hours. I allow mine to warm up before I feed it. I take out my ensilage in the afternoon for the next day's feed; I mix with it a little grain and put it in a tight box, because in cold weather if it is spread out on the barn floor it will not warm up.

Question. What is the cause of the heat?

Maj. Alvord. Fermentation. The fermentation which you have stopped originally by shutting out the air has started again by letting the air into it.

A Farmer. I will say that that is my greatest difficulty, the warming up of the ensilage. When I open it it is perfectly cool on top; but after I open it I have to feed it faster than I would like, perhaps, in order that it may not spoil. When I pitch it out it will steam clear to the top of the barn, although it is packed so solid that I can hardly work it out.

Maj. Alvord. I would suggest that you let your corn get a little riper and wilt it several hours before you cut it up and put it in.

ENSILAGE FOR SHEEP.

By D. J. Briggs, Turner.

The matter of a food supply for our domestic animals is one of great importance to the farmers of this country. In the making of beef, pork, mutton, butter, cheese and milk, easy and cheap transportation brings us into close competition with other portions of the country, hence it becomes of the greatest importance that we should aim to get the most possible from our soil and secure growth with little expense. The introduction of the silo is one important factor in this direction.

Sheep husbandry has not been dwelt upon of late by our agriculturists as much, perhaps, as its importance will bear. The depression in the wool market no doubt has had something to do in this direction. Still, though the returns from sheep are not as large as could be wished, yet they must continue to have an important place among the stock of the farm.

Unlike the most of our farm stock, sheep will stand dry feed about so long, after which they will begin to falter. They will bear to be fed only lightly on concentrated food. It therefore becomes necessary to furnish food of a succulent nature. Heretofore turnips have been raised to fill this want. Corn ensilage, however, proves to be preferable. This puts the stomach of the sheep in a condition that will enable it to digest more food than when the animal is fed on dry fodder alone.

When ensilage is fed in perfect condition I can conceive of no form of food better adapted to easy digestion or from which the nutriment is so easily and perfectly extracted by the animal. There is something about ensilage that makes the animals look and appear as they do when feeding on luxuriant pasturage. Years ago, when I first commenced feeding sheep for mutton and for early lambs for Boston market, I fed largely on turnips in connection with grain and hay. This was quite a success for a while, but as competition grew sharp roots became too expensive. About this time the silo came into notice, and I gathered all the information in regard to this method of preserving fodder that I could, and the result was I went and built a small silo and filled it. When feeding time came around the silo was opened and I commenced feeding the contents in connection with hay and grain, as turnips had formerly been fed. Better results were secured and at less expense than before. Previously there would be occasional trouble with an animal, but when fed on ensilage all such trouble has disappeared and the sheep continue healthy and thrifty.

Ensilage serves the double purpose of food' and drink. If fed liberally on ensilage they will require but little water to go with it, the water in the food supplying all their wants. Also this food from the silo seems to be about the right temperature for the best health of the sheep. I would not recommend feeding ensilage exclusively and omitting all other fodders. Sheep enjoy a variety of food, and we get better returns by meeting this want.

A silo properly built and properly filled is one of the best investments for sheep farming a farmer can make. The contents are, comparatively, easily and cheaply handled, the sheep appear to be eager for it, and it seems to meet their wants.

In raising early lambs it is necessary to have the sheep in a condition to give a large amount of rich milk. Good ensilage seems to fill the bill exactly. I never have discovered anything that would produce more or richer milk than ensilage when fed in connection with other feed. It seems to be a necessity, and can no longer be considered an experiment.

Maj. ALVORD. I am very glad to get this corroborative testimony as to the value of the use of ensilage in the feeding of sheep, and especially with ewes carrying lambs; because I know of but very few cases where that has been tried. We all know we cannot do much with sheep and lambs without roots or something to take their place, and it seems to me that this is one of the places where ensilage is going to work well. Almost any good root cellar can be made into a silo economically, and then if you don't like it you can change it back to a root cellar. I have here an account of an experiment with lambs, which I will read:

"Two pens of Southdown lambs 10 or 11 months old—three lambs in a pen—were selected from a large number to secure evenness of weight and feeding capacity. They were treated alike for two weeks and then weighed. Pen No. 1 weighed 213 pounds; pen No. 2, 216 pounds. Then they were fed for 42 days as follows: To each pen 3 lbs. grain (1 lb. per head) composed of 2 lbs. corn meal and 1 lb. cotton-seed meal; to pen No. 1, 2 lbs. cut hay and 1 lb. cut oat straw; to pen No. 2, 12 lbs. corn ensilage (fodder corn in tassel). The following figures give the results:

No. of Pen, 3 Lambs in each.	Weight at the Start.	Gain in Six Weeks. Lbs.	Daily Food Per Pen.		Cost of the Food for 6 Weeks.	Value of Weight Gained in 6 Weeks.	Net Gain.
			Grain as Above.	Long Forage in Lbs.			
No. 1,	213	32	3 lbs.	3 lbs. dry.	$2.98	$3.20	22 cts.
No. 2,	216	28½	3 lbs.	12 " ensil'ge.	2.48	2.85	37 cts.

The manure and labor were reckoned as offsetting one another. Pen No. 1 drank an average of ten lbs. water per day; pen No. 2 drank 1 3-4 lbs. water per day."

Here is another trial to ascertain the efficiency of maintaining "store sheep" on ensilage:

"Two wethers, 2½ years old, were selected in December, separated and fed separately until January 5th, when, having become accustomed to the changes and their new rations, the record was begun and continued eighty days. During this period the sheep No. 1 was fed 1 lb. each daily of wheat bran, oats and cut hay; sheep No. 2 was fed 7 lbs. 3 oz. daily of corn ensilage. Periodical weighings have been as follows:

SHEEP.	Jan. 5,' 83.	Jan.17	Feb.3	Feb.17	Mch.3	Mch.17	Mch.28	80 Days
No. 1 (dry),	122½ lbs.	122	119½	121	117¾	114¾	113½	L., 9 lbs.
No. 2 (ensilage),	135 lbs.	134	136¼	136¼	130¾	131¾	132	L., 3 lbs.

"During the trial No. 1 has drank an average of 4 lbs. 2 oz. water daily; No. 2 none. The effort has been to maintain the sheep at a fixed weight; but the one on ensilage alone would not eat enough to prevent loss. It was fed in the 80 days 674 lbs. of ensilage (nearly 8½ lbs. per day), but of this it refused to eat 107 lbs., or about 1 1-3 lbs. per day. The other sheep would have eaten more grain, but it was kept as closely to its mate as possible. During the 80 days' trial the food of the hay and grain-fed sheep (No. 1) cost $2.80, and that of the ensilage-fed (No. 2) cost 70 cents."

Mr. BRIGGS. The question may be raised here, How much is a ration for a sheep? My rule is three pounds of ensilage and one of grain. That makes a good feed for a sheep with a lamb. I used to raise a large amount of turnips and feed them to sheep, as I now do ensilage, in raising early lambs. It takes a little longer to mature the lambs when I feed ensilage.

THE CHEMISTRY OF THE SILO.

By Prof. W. H. JORDAN, Director of Experiment Station.

In discussing the chemical changes that take place with plant substance that is preserved in the silo, or the modifications that occur in the composition of such material, it is convenient to divide the subject into three divisions, viz:

(1) The composition of fodder plants.

(2) The nature and results of the fermentations which occur in the silo.

(3) A comparison of the composition of the ensilage with the composition of the original material placed in the silo.

(1) The composition of fodder plants. All plants contain numerous compounds which may be divided into four classes, as follows:

(*a*) Compounds containing nitrogen, or albuminoids, amides, etc.

(*b*) Compounds containing no nitrogen, including starch, the sugars, etc. [The carbohydrates.]

(*c*) The fats.

(*d*) Mineral substances.

(*a*) The nitrogenous compounds of plants that can be considered as having food value are the albuminoids and amides. The albuminoids are represented by such familiar substances as the muscular tissue of animals (lean meat), the gluten of wheat, etc. Plant albuminoids are transformed in the animal into animal albuminoids, these being the substances from which the muscular tissue, skin, hair, etc., of herbivorous animals are formed. Amides are nitrogenous compounds which result often from the breaking down of albuminoids, and which, when in the pure or crystalline condition, closely resemble mineral salts. While amides have food value, it is not yet demonstrated that they are flesh formers in the same sense that the albuminoids are. Amides occur in fodder plants much more abundantly than in the grains.

(*b*) A large part of all our fodder plants is made up of starch, the sugars, woody fiber, and other compounds closely resembling these. Starch, granulated sugar (saccharose), the principal sugar of some syrups (glucose), and paper (the woody fiber of certain plants), are very familiar substances which need no description as to their external characteristics.

(*c*) All plants contain more or less of oils or fats, familiar examples of these being cotton-seed oil, linseed oil and olive oil. In the plants ordinarily preserved in the silo the oils exist in smaller percentages than the other classes of organic compounds mentioned.

(*d*) The mineral portion of a plant is what remains as the ash when the combustible part is burned. It consists mainly in ordinary farm crops of phosphoric acid, sulphuric acid and silica, potash, lime and magnesia.

Of the various compounds found in plants those belonging to the mineral part or ash are the only ones not subject to loss by decay and the formation of volatile products. The nitrogenous compounds, the carbohydrates, and the fats, may be changed entirely, either by slow or rapid oxidation, into gaseous substances which under ordinary circumstances disappear by diffusion into the atmosphere.

(2) The fermentations that occur in the silo.

Almost immediately upon packing any green crop in a silo, a rise of temperature begins in the contents. This elevation of temperature is accompanied, as chemistry has shown, by the escape of at least one gaseous substance from the silo besides water, viz: carbonic acid, and by a corresponding loss of certain compounds from the ensilaged material. These changes are due to, in fact are a part of, fermentations that take place more or less vigorously, according to circumstances, and which are a result of the activity of certain minute forms of vegetable life. The principal fermentations that occur in ensilage are the alcoholic, due to a plant known as Saccharomyces cerevisiæ, the acetic caused by Mycoderma aceti, and the lactic, produced by Bacterium lactis. The first of these fermentations is seen in the housewife's yeast bottle, in the barrel of new cider, and in beer, and results in the formation, besides other minor compounds, of alcohol and carbonic acid. These two compounds are produced at the expense of the sugar contained in the fermenting substance. The presence of sugar is therefore essential to alcoholic fermentation, as also are compounds of nitrogen, and certain mineral salts. The nitrogen compounds and mineral substances serve as food for the yeast plant, which is able to grow only when it can be active in breaking down sugar as previously described.

Acetic fermentation has for its result the production of acetic acid from alcohol, and is only possible in the cider barrel and silo because of a previous alcoholic fermentation. Ensilage and cider must become alcoholic in order to become sour from the presence of acetic acid, which is the acid of vinegar.

Lactic acid, or the acid of sour milk, is produced directly from sugar (from any one of several kinds) through the action of the lactic ferment. This, and acetic acid, are the principal acids which form in the silo, although some butyric acid (the acid of strong butter) appears in ensilage, being produced from the lactic acid.

The general result of all the fermentations and attendant changes described above is to break down, or oxidize into simpler compounds, some of the constituents of the plant substance. Heat is thus generated, and the temperature of the silo raised much above that of the surrounding air. In other words, a certain amount of work is performed by the consumption of a certain quantity of fuel in raising several degrees the temperature of the water and other substances contained in the ensilage,—work that would be accomplished in the animal by feeding the fodder corn before fermentation.

As before indicated in a general way, the sugars (or at least the carbohydrates) of the fodder corn are the material that serves as fuel, and upon which the greatest loss falls. Changes also occur in other compounds, especially in the albuminoids, which become broken down into amides, or even into ammonia salts when the fermentation is rapid and long continued.

The principal chemical changes that take place in the silo may be briefly summarized as follows:

Fermentations occur in the ensilaged material which result in breaking up the sugars and other carbohydrates into water, carbonic acid, alcohol and various acids. The carbonic acid and some water escape, and the alcohol becomes in part, at least, still further oxidized into acetic acid.

Under the influence of these fermentations a modification occurs in the composition of the nitrogen compounds, albuminoids being converted into amides and ammonia salts, causing in some instances a loss from the silo of nitrogenous material. The extent of all these changes varies of course with the manner of preserving the ensilage.

(3) The composition of ensilage as compared with the *original* material.

There is given below a brief summary of the results of quite a number of investigations into the effect of fermentation in the silo upon the composition of green fodder.

Von Gohren compared the composition of fermented maize with that of the original material, and found a slight loss of nitrogenous compounds. The ensilage had an alkaline instead of an acid reaction.

Fittbogen analyzed fodder beets before and after fermentation in the silo, and found that about eighty-two per cent of the sugars had been destroyed, and that the sour beets contained 1.2 per cent of lactic acid.

In one investigation by Lechartier the loss of carbonic acid from the silo equalled 2.18 per cent of the whole weight of the material in the case of maize, and 1.42 per cent in the case of clover. The total loss, not including water, was 4.077 per cent and 5.135 per cent in the two cases, which was not far from one-fifth of the total dry substance in the original material. A later investigation with maize gave about the same result. The loss of sugars in three cases with maize varied from about two-thirds to about nine-tenths of the total sugars in the original material.

H. Weiske found a loss of about one-fourth of the dry substance of the material that was fermented, the loss of nitrogenous compounds being one-eighth, of crude fiber one-fifth, and of extractive matter (sugar, starch, &c.) two-fifths.

A. Mayer put about 27,000 pounds of fodder maize into a silo and got of ensilage, after fermenting one and one-half months, 18,600 pounds. Analysis of the fresh and fermented material showed a loss of about 40 per cent of the dry substance, which fell upon the nitrogenous compounds and carbohydrates in about the same proportion. Mayer investigated, in a similar way, three other cases, maize being used in each case, with the following results:

Fifty-one thousand five hundred pounds of green maize furnished 43,900 pounds of ensilage, with a loss of 18 per cent of nutritive material. Fifty-three thousand five hundred pounds of green maize furnished 51,000 pounds of good ensilage, a loss of five per cent of the weight. Thirty thousand pounds of green maize furnished 22,800 pounds of ensilage. The total loss was not far from 20 per cent, which was about the same with the nitrogenous compounds as with the carbohydrates.

Moser buried small bundles of maize at different depths in a silo, its composition being determined before and after fermentation. The loss varied somewhat according to the depth of the bundles, but averaged for the nitrogenous material 32.3 per cent, and for the carbohydrates, exclusive of crude fiber, 53 per cent.

Kellner buried weighed quantities of fresh material in a silo in water-tight vessels, and after fermentation found by analysis that 51.8 per cent of the albuminoids had been decomposed (probably into amides mostly), that 31.6 per cent of the crude fiber had been destroyed, the total loss of dry substance being 18 per cent of that put in.

In a later investigation, Kellner placed fresh material in water-tight closed glass vessels, some near the surface and some in the center of the silo, and also wrapped some of the same material in cloth and placed the bundles in the silo. Analyses before and after the fermentation showed that in the case of the material placed in two glass vessels, the loss of nitrogenous compound was 4.24 and 21.60 per cent, respectively; of crude fiber 15.69 and 17.10 per cent; of carbohydrates exclusive of crude fiber 8.80 and 12.71 per cent. A part of the albuminoids was converted into amides. The loss in the vessel near the surface of the silo was much less than in the vessel near the center where the heat was greater, from the former being only 1.33 per cent of the dry substance, while from the latter it was 13.67 per cent. In the case of the material wrapped in cloth, the loss was much greater, due in part to the fact that the juice was pressed out of the fermenting mass.

Both Stuetzer and Schulze have studied the effect of fermentation upon the albuminoids of ensilage, and have found that they are broken up into amides to quite an extent.

All the above-mentioned results are those reached by German investigators.

The New Jersey Experiment Station made an investigation as to the extent of the loss incurred by fermentation in the silo, and found it to be 18 per cent of the dry matter, this loss being almost wholly of carbohydrates, such as sugar, starch, etc.

At the Pennsylvania State College an inquiry was made by the writer into the changes that take place in the composition of material fermented in the silo. During four years the loss of organic matter in large masses of ensilage was found to vary from 5.4 to 12.2 per cent; of nitrogenous compounds from nothing to about 10 per cent; and of starch, the sugars, etc., from 7.6 to 20 per cent—in each case the percentages being reckoned on the basis of the amount of each ingredient put into the silo.

Except in one case, the loss of nitrogenous material was practically nothing. In the case of ensilage made in very large tubs, it was found that the loss of material fell nearly all upon the sugars.

It was also found that from one-quarter to one-third of the albuminoids in the fresh material were converted into amide substances.

The total free acids in three cases varied from 1.14 to 1.26 per cent of the total weight of the ensilage, which figures do not differ greatly from those obtained by a large number of analysts.

The above cases cited by no means cover all the investigations that have been made to determine the chemical changes in the silo, but they are sufficient to show the nature and extent of these changes. It is very easy to see that the amount of material destroyed varies greatly in different cases. This fact has an important bearing upon the claim that "sweet ensilage" can be produced by allowing intense fermentation at first, and so kill certain germs that are the cause of the production of certain acids. Even if we were in possession of proof that such a method of procedure has in any instance produced ensilage devoid of free acid, it would be still a question whether any advantage is gained sufficient to warrant such an increased destruction of nutritive material.

CUMBERLAND COUNTY.

Institute at New Gloucester.

The Cumberland County Farmers' Institute was held at New Gloucester, January 15, with a good attendance through the day and evening. In the forenoon there was a discussion of "Poultry Interests," led by Dr. G. M. Twitchell of Readfield; the afternoon was given to the subject of Dairying, and in the evening Prof. W. H. Jordan, Director of the Experiment Station, gave a lecture on Plant Food. Only the exercises of the afternoon are here reported.

DAIRYING THE BEST FARMING FOR FARMER AND FARM.

By HENRY E. ALVORD, of Houghton Farm, New York.

The first duty of the farming of this country is to provide our own people with food and clothing. The fifty millions enumerated five years ago have increased to more than fifty-seven, and will soon number fifty-eight. Allowing for the less necessities of children, there is still an equivalent of 50,000,000 adults to be supplied. That this increasing demand is well met, so far as quantity is concerned, is shown by the great surplus annually sent abroad of corn and wheat, cotton and meat. For twenty years, agricultural products have constituted more than three-fourths of the total exports from the United States, while in single recent years this proportion has reached 83 per cent and amounted in value to nearly 900 million dollars. It is manifest, moreover, that this superabundance of agricultural production will continue, despite any possible increase in population during the present century.

But the wisdom and economy of our present systems of production and disposition is a very different matter. One of our most acute statisticians and economists (*) has lately presented the startling fact that "the whole accumulated wealth of the country, aside from land, does not exceed two or, at the most, three years' production," and that the average product to each person in this most prosperous

* Hon. Edward Atkinson of Boston, before the American Association for the Advancement of Science.

land, measured in money at the point of final distribution for consumption, does not exceed fifty to fifty-five cents per capita, per day. In other words, our total product or income as a nation is such that after the necessary outlay to maintain our capital and the payment of all taxes, there remains only enough to allow from forty to forty-five cents per day with which to provide shelter, food and clothing for every one of our people. "This is the measure in money of all that is produced, and we cannot have more than all there is." Plainly, we have a small margin to work upon, and it behooves us to husband all our resources. But as a nation we are not doing it. The fact cannot be denied that even on the rich soil of some of our richest States the average production per acre is steadily decreasing. This is a very serious matter and deserves careful consideration.

Vegetable products form the basis of all agriculture. To produce useful plants the soil must contain certain known elements as plant food. For any of these elements of fertility to be available, all must be present in the soil in fair proportions. Every crop removed from the land diminishes its store of plant food and thus reduces its productive power. The process of constant drafts without equivalent return deposits is as certain to end in bankruptcy in farming as in finance. And it may be remarked that, similarly, those who have accumulations in the savings bank, as the result of years of toil and frugality, generally husband their capital, while those who inherit a large bank account are very apt to waste their patrimony. We boast of our great exportations of agricultural products, forgetting that this really means the sending to foreign lands of great blocks of our store of natural fertility, thus disposing of the main source of our agricultural wealth by the ton and by the million. When we export products which are sold for $800,000,000, this includes available plant food, all needed at home, which we cannot replace for less than an expenditure of $50,000,000, or six per cent of the whole. And this fertility never comes back; it goes to enrich other lands, or is washed into seas from which we do not even get the fish and kelp. Those of us who are contending with impoverished soils are well placed to appreciate the sober subject of agricultural exhaustion and are in duty bound to give an earnest word of warning to those who labor on newer lands. "Uncle Sam" is an active and industrious body with numerous irons in the fire, but his chief occupation is farming, and so it will be for many years. He is carrying a big debt, incurred in a good cause and standing in the nature of a mortgage on his property. He is anxious to lift the burden. But it is a most mistaken policy to run down the farm and, in order to leave his family debt-free, bequeath their exhausted soil and worn-out machinery. His wide-awake boys, aye, and generations more remote, will be far richer to have the fertility of the great farm maintained, and all kept in working order, even although a good share of the funded debt also falls to their lot.

With our rapidly increasing population and a constantly lessened fertility of soil, we have presented to us the gravest questions in connection with our farming. By the wasteful processes prevailing, we are expending our very substance, and daily adding to a burden under which generations to come will stagger. The truly economic production of food and clothing for our people, and the wise arrangement and disposition of our surplus, are the great problems for the future of American agriculture. Political and social science must, then, be applied to the economic distribution and consumption of the products of the farm.

The researches of modern science have done much in establishing truths of practical value in our farming operations. None are more important than those which teach us the effect upon the fertility of the land of the removal of different crops and products and what should be consumed at home and what may be profitably sold. Thus, if a ton of farm produce be removed from a western farm to an eastern market, or from any American farm to an European market, it makes a vast difference eventually to the producer and owner of the land where produced, whether this be a ton of corn or wheat, beef or butter. In just this difference lies the practical lesson that domestic live-stock, in due proportions and properly maintained, are essential to far-sighted, well-conducted and profitable agriculture. More live-stock and better care of it is the only salvation of our worn lands, the shortest and surest means of recuperation in the East, and the sole method of preserving the fertility of the West.

A careful study of the consumption of food by the great industrial classes in this country, both as to quantity and cost, shows that, approximately, computing our population as an equivalent of fifty millions of adults, $100 is annually expended for food, and $30 for clothing and household goods. Half the whole cost of food is assigned to animal products, $30 for meat and poultry, $20 for dairy products and eggs. This is widely at variance with the teachings of nutrition and domestic economy. The same food value, and in the form of a very satisfactory diet, could be obtained for half this expenditure for animal food. We are notoriously a people of an abundant and really extravagant diet, and the great majority will prefer to continue expending twenty-five per cent more than is necessary for food, rather than give up their generous meat supply. While, therefore, it may be useless to discourage so great a consumption of animal products, we should certainly contribute to cheapening their cost. By encouraging the increase of our herds within proper limits, by assisting in their protection from disease and disaster, by aiding in the consumption of vegetable products as near as possible to the place of production, the lessening of our surplus of bread stuffs, and increasing the home consumption and export of animal products, we so act as to not only maintain but improve the fertility of our soil, and actually do more than to make two blades of grass grow where but one grew before. And by reducing the first cost of animal products on the one hand and lessening their cost to the consumer on the other, we may directly contribute to human welfare. If the fifteen cents which the average person in America daily expends for animal food could be reduced to twelve (as I believe it may, and with profit to the producer) the saving in the cost of living would be a million and a half dollars a day, or enough to pay off the entire national debt before a president is again inaugurated.

My special purpose at present is to invite your attention to dairying as the most important branch of animal industry, and as the best both for the farmer and for his farm. It is hardly necessary to even rehearse the proportions which dairy production and the dairy trade have assumed in this country, and yet a brief comparative statement seems appropriate here.

In round numbers, our neat cattle represent half of the $2,500,000,000 invested in live-stock on the farms and ranges of this country. And of these cattle, 14,000,000, or nearly one-third the whole number, are milch cows. In value, these milch cows constitute a good deal more than one-third of the entire capital in cattle. To be conservatively safe, we may reckon the cows fairly classed as dairy animals at between twelve and thirteen million, and these may be roughly divided as eight million butter cows, one million for cheese and four million for milk supply. Without counting the yearly increase in calves from milch cows, the aggregate products of the dairy are annually equal in value to the dairy cattle themselves, being nearly, if not quite, $400,000,000. This is equal to half the estimated total meat products. The products of dairying, therefore, form at least two-fifths of the entire annual products of cattle growing in America.

In a classified list of the agricultural products of the nation, arranged according to values, meat stands first, corn second, and the dairy third. Wheat and hay come next, but, with a few exceptions, our dairy products for several years have been worth more than our wheat crop, and more than our hay crop. Our butter product alone is worth more than our cotton crop, and the milk we consume as food is worth as much as our crop of oats. The whole issue of national bank notes would not purchase the products of our dairies the present year, and the aggregate banking capital is less in value than beef and beef products which are placed upon our markets every twelve months.

The development of American dairying exhibits the greatest progress ever made in any branch of agriculture, for it combines rapid growth with remarkable improvement. The application of mechanical skill and the activity of inventive genius is an excellent indication of the advances of any industry in this country. Perhaps nothing shows our dairy development more than the fact that from the opening of the United States Patent Office, more than eighty years ago, to the present time, there has been more than one application for every fortnight for a patent on churns, and during the last twenty-five years a new or improved churn has been invented every six days.

Our dairying was without unusual features until about 1840, and the great growth has occurred within fifty years. In that time the number of milch cows in the United States has tripled and their products have quadrupled in value. It is within the memory of us all that, like the Great American Desert, the famous "Dairy Belt" has faded away and is heard of no more. The idea so long maintained, that the profitable dairying of the country would always be monopolized by a district confined within certain narrow geographical limits, has been thoroughly exploded. It has been amply shown that good butter and cheese can be made, by proper management, in almost all parts of North America between the 32nd and 50th parallels, and perhaps this is drawing the lines too close. Generally speaking, the territory where good butter can be profitably produced is more extensive than that with satisfactory conditions for even limited beef production. Even the influences of climate, soil, water and herbage are largely controlled and what is lacking in natural conditions is supplied by tact and skill. We find some of the best records of dairy performances, both as to quantity and quality of single animals and whole herds, in the higher latitudes of Canada and in lower Tennessee. In remote districts of Minnesota, on the plains of Nebraska, in the mountains of Colorado and California, among the old cotton-fields of Mississippi, and in the highlands of Florida, dairying has assumed a commercial importance, and I know of establishments in all these places where butter or cheese, or both, have been made long enough and with such success as to fully satisfy the owners and friends of these respective enterprises.

The factory system is the characteristic feature of American dairying and the one to which this industry owes its greatest advance during the present generation. We all know the wonderfully rapid extension of this system during recent years. The census of 1880 enumerates nearly four thousand dairy factories, with a capital of $10,000,000 and a total product valued at $26,000,000, and reasonable estimates now place the factories at 6000. It is true that of all the dairy products of the country, a very small portion are yet factory made, but equally true that it is the factory which gives this industry its present commercial importance and which marks the greatest advance of the century in the relations of dairying to the farmer and his family. It may be compared with the change from the wheel and the hand-loom to the woolen factory, and it is just as certain to be permanent. I cannot at all agree with those who claim that private dairying is now gaining on the factory system either on the part of the farmer or as judged by the markets. We still see occasionally, at our local fairs, skeins of homespun yarn and pieces of cloth which attract attention and generally sell at prices above the market for choice factory products of a similar kind. This is partly the result of their rarity and partly because of intrinsic merit. So for years to come, there will doubtless be single dairies in many places whose products will sell at exceptionally high prices, and probably deserve to, but the total of such sales will form an inappreciable portion of the general dairy market. Our factories are by no means perfect and often fail to give satisfaction to their patrons. This, however, is no radical fault of the system, but results from errors of details or of individual management. Improvements are needed and will be made, and dairy butter will become as scarce an article in our markets as dairy cheese. I also expect to see a great extension of the cream-gathering plan, in butter-making districts. The combined butter and cheese factory has seen its best days and one dairy product or the other must be the sole out-put of the successful factory of the future. For the butter factory, pure and simple, the skim-milk becomes practically a waste product, and the only rational system is to handle the cream alone. It is as absurd for the farmer to send away his whole milk to make butter as it would be to drive his flock to the woolen-mill, or for the planter to bale his cotton without ginning and thus sacrifice the seed.

Great as the progress of dairy husbandry has been, there remains, as in all branches of animal industry, ample room for improvement. We are keeping too many milch cows for their aggregate product. The gain in this particular is fast, but not fast enough. But a few years ago a friend of mine, who was supplying milk in a New England town and where the dairy stock of the vicinity was good, made a standing offer of $100 for every cow which would give fifty pounds of milk daily for three days, on his farm. This was almost double the price of the best dairy cows, but none of those presented reached his standard. Recently, I periodically witnessed and verified the performance of a cow which, with her second calf, produced one hundred pounds of milk a day for a month, and yearly records of ten thousand to twenty thousand pounds are by no means rare. The average milch cow of the United States, and by this I mean the cow kept for her milk product, does not yet give four hundred gallons a year, and in the special milk-making regions the average does not exceed five hundred gallons. Yet there are numerous single herds of ordinary breeding, but well selected, where the annual yield is from eight hundred to nine hundred gallons per cow, and others of pure-bred dairy animals where the average ranges from one thousand to twelve thousand gallons per cow. These illustrations of the possibility of increasing our milk supply from a less number of cows apply as well to butter and cheese. It is certainly more than possible to so improve our herds that in a few years our present dairy production can be secured from half the number of cows we now feed. The improvement in progress in this direction, although slow, is very positive. From 1790 to 1860 the increase in number of milch cows kept even pace with the population.

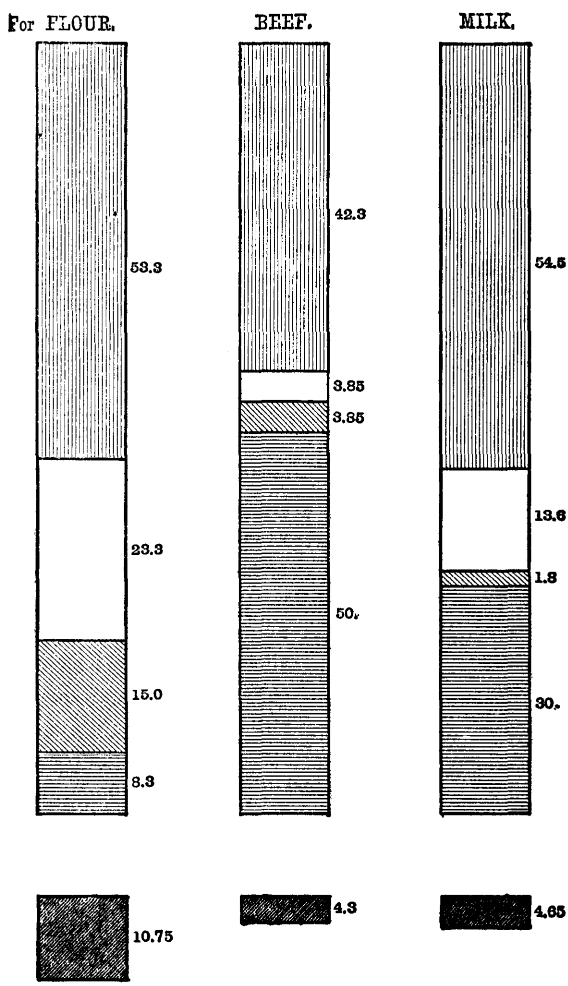
Twenty-seven cows to 100 inhabitants was the rate which did not vary one per cent during these seventy years. But in this time production increased so there came to be a surplus of products. Now, with but 23 cows to every 100 people, our surplus is still greater. Our dairy interests will be better conserved by a decrease in the number of our cows, and a gain in their quality, than by any increase in number (at least in the ratio to population).

The question of surplus in American dairy products is one of more or less uncertainty. A short time ago it seemed impossible for dairy production to be overdone for years to come. But for the introduction of adulterations and substitutes for butter and cheese, there could yet be no surplus unfavorably affecting our markets. How far this substitution has extended and its real effect upon the prosperity of dairying it is impossible to determine. The export trade has been injured in some way and undoubtedly in part by loss of reputation resulting from frauds in dairy products. And we know but too well the vast quantities of bogus butters and skim cheese with which our domestic markets have been flooded. I put these two classes of wares upon an equality as frauds. For the skim and half-skim cheese dairymen are themselves responsible, and the cheese trade has suffered as much at their hands as the butter market has from bogus butter in its various forms. If our dairy market could be freed once more from these cheap imitations of genuine butter and cheese, it is safe to say that our dairies could not produce a surplus for many years. But as matters stand the case is very different, and already perplexing enough. What shall be done on the part of our dairy interests to meet this insidious attack has become a very serious problem. It *is* an insidious attack, and not open competition, because the imitations and substitutes are almost universally sold, at all events by the retailer, as pure butter and cheese. I lately heard a man declare in New York that, with a moderate capital, he was able with his factory to put as much "butter" on the market in a month as thirty thousand dairymen! He called his product "butter," and just there lies the worst feature of the case. If the goods could always be made, sold and consumed with a full knowledge of their real character, the evil would be mainly removed and little just ground for complaint would remain.

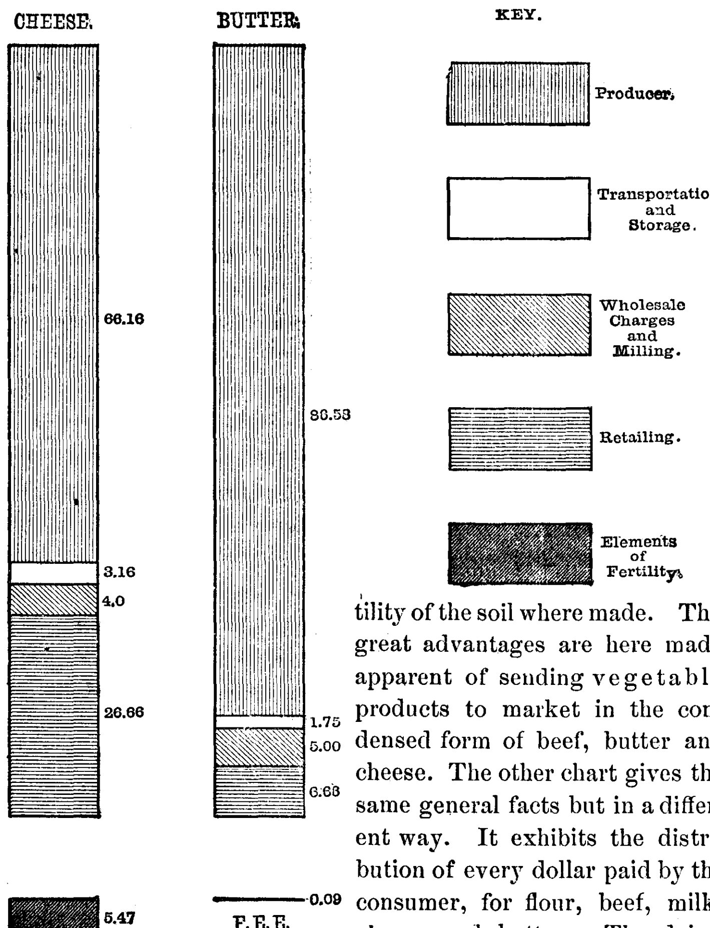
American like, the first appeal for the relief of the dairymen from this new evil was made to legislation. But, although laws in great variety have been enacted in different States to meet the case, the result is far from satisfactory. In New York we have tried the policy of prohibition. The statute, however, attempted to cover far too much ground, was drawn with a very superficial knowledge of dairy facts and needs, railroaded through the legislature with no opportunity for deliberation and debate, and as a result it proves very ineffectual notwithstanding the creation of special officials, well supplied with money, to enforce the law. On the other hand, a State law of New York requiring the branding of all cheese made in the State to show whether it is a full-cream article, or the degree of its impoverishment, is found to be easily executed and has already done much to restore confidence in the market and improve the quality of cheese-factory products.

As a rule, however, very little is to be gained by making new laws on matters of this kind. Markets are neither created nor supplied by legislatures. The danger of our time is the constant resort to legislative remedies for evils which can only be removed by individual effort and industrial progress. The moment special legislation is sought, reciprocal alliances become necessary, and, odd as it may seem, it is a well-established fact, that in the work of "log-rolling," the farmer always comes off the loser. We had far better cry, hands off, give us free trade. These two little words, used with no revolutionary intent, but for just what they actually mean, are of great importance to all our live-stock interests.

Instead of hasty appeals to protective legislation, let there be earnest and united effort on the part of dairymen and tradesmen. Improvement in our cattle, and economy in their management, resulting in dairy products of higher quality sold at reduced prices, are the measures surest to overcome competition from any substitutes for pure butter and cheese. At the same time, much needs to be done in varying the forms of our products and educating consumers and extending consumption. A recent careful study of the relative retail prices and nutrient qualities of all the common food products showed that consumers can in no way get so much food value for their money as in the purchase of dairy products. Skim-milk, butter-milk and cheese at their usual retail prices are cheaper as nutritious food than any other articles on the long list, and are approached in this respect only by fresh mackerel and dried cod-fish. Butter, on the contrary, is a luxury rather than a food and always sells for two or three times its real food value and often more. Dairymen may be comforted by the fact, however, that Americans like butter as well as meat. It is one of our national extravagances. We are the greatest butter eaters of any people in the world. The trouble now is that a very small percentage of consumers know what good butter is, and they are thus easily swindled and satisfied with a bogus article; but it is not difficult to improve the taste of the average consumer, and with a little effort he can be so educated as to absolutely condemn the best concealed attempts to blend with superior "Elgin creamery," while passing through Chicago, the unctuous virtues of the Western hog. It is a sad comment on the domestic economy of America that while our people consume more butter per capita than in any other nation, they are among the very smallest consumers of cheese. The cheese used in this country does not amount to three pounds per annum for each person—while in England the usual estimate is over twelve pounds, which is a greater rate per capita than the British consumption of butter. There is no food better or cheaper than cheese and its production and consumption in this country ought to be very largely increased. To accomplish this two things are mainly needed. There must be diversity of form and flavor, and, in some way retailers must be made to content themselves with less than their usual fifty-per-cent profit. When a sixty-pound box of fine full-cream cheese can be bought at ten cents a pound in any of our large markets, the same article will be found selling within half a mile at fourteen to sixteen cents a pound, sometimes eighteen, according to the style of the retail store. Well-made cheese in any form that is small enough to be taken by a consumer uncut are comparatively rare, and when found, usually sell readily at quite high prices. I know a little cheese made in Otsego County, New York, in the cheddar form, but weighing only five pounds; this because of its attractive size, apparently, sells at wholesale in New York City for twenty cents a pound, when exactly the same thing in the usual market form will bring but thirteen or fourteen cents. The consumption of milk as well as cheese, particularly in our large towns and cities, is far below what it should be. Here, again, one of the chief obstacles is the retail price, although milk is comparatively one of the cheapest articles of food. But the business of milk supply is, as a rule, carried on in a most unsystematic and wasteful manner. Thorough reformation and re-organization is needed. This great field is a promising one for co-operative effort. The usual cost of final distribution, including the retailer's profit, is from two to three cents a quart, often more. Yet it has been demonstrated by well-managed milk associations in several places, notably at Syracuse, New York, and Springfield, Massachusetts, that this service can be performed for one cent a quart, or even less. Then, again, the trade in skim-milk, the very cheapest form of food, is not half developed. A very mistaken idea very generally prevails as to this article, and in many large cities where its general distribution would be a public blessing boards of health absolutely prohibit its sale and actually destroy all skimmed milk that can be found.



In conclusion, let me now invite your attention to two diagrams which graphically illustrate some of the points to which I have already referred. The first shows the relative proceeds, at retail, in average domestic markets, of one ton each of flour, beef, milk, cheese and butter, and the apportionment of these proceeds between producers, transportation companies, wholesale and retail traders. It also shows the draft of these several commodities upon the fer-



tility of the soil where made. The great advantages are here made apparent of sending vegetable products to market in the condensed form of beef, butter and cheese. The other chart gives the same general facts but in a different way. It exhibits the distribution of every dollar paid by the consumer, for flour, beef, milk, cheese and butter. The dairymen get a much larger share of the gross proceeds than the meat growers. The expenses of transportation and wholesaling are comparatively small, but the share for cost and profit of retailing is unreasonably large, especially in the case of cheese and beef. This is manifestly a place where reform is necessary. The black section below each colored column, drawn on the same scale, shows the part of the dollar received, which may be considered as meaning the elements of fertility which leave the farm with these respective products. Thus we see the grower of wheat, out of every dollar received, should know that ten to twelve per cent represents the reduction of his capital in his soil, while the corresponding effect of selling butter is so small that it can hardly be shown on the diagram.

It is evident that the ultimate effect upon the production of our lands is one which deserves to be always before us in determining what we will grow and what we will sell and especially what shall be exported.

It may be claimed that economical and political reasons have justified, in the past, the cultivation of the soil at the expense of future generations. This wasteful culture has produced the accumulations which have been the source of all our apparent wealth, other than land, and enabled us to make all our great public and private improvements. "Thirty-eight noble States, in an indissoluble Union are the justification of this policy. Their school-houses and churches, their shops and factories, their roads and bridges, their railways and warehouses, are the fruits of the characteristic American agriculture of the past."

But these excuses for wasteful systems no longer exist. The country in its arable parts is settled and the line of population now rests near the base of the great mountains which occupy so large a portion of the continent. The time has come when a continuance of this policy will be, not the improvement of our patrimony but the impoverishment of our posterity.

Economical and political considerations alike demand that the soil bequeathed to this generation or opened up by its own exertions shall hereafter be deemed as held a sacred trust for the American people through all time to come, not to be diminished or impaired for the selfish enjoyment of its immediate possessor.

A solemn obligation thus rests upon the farmers of this country, now and hereafter, and in the performance of this manifest duty, none are nearer right than those who are engaged in the rearing of live-stock, and more particularly those in dairying.

I hope that this will demonstrate to you how much nearer the dairyman gets to the consumer than the producer of beef or of grain. We could multiply these articles if we chose, but I have taken the standard articles of wheat, flour and beef to compare our dairy products with. We are very often inclined to find a great deal of fault with the railroads and with the excessive cost of transportation, imagining that there is a place where a large part of our profits are swallowed up. I confess that it was my firm belief that the railroads draw much more than the proper proportion of their profits from the farmer. The tax which the railroads lay upon farming is in my belief larger than that upon any other business. We have to pay tariffs on everything we buy that goes onto the farm and almost everything that leaves the farm has to pay another tax to the railroad. But when I came to investigate this matter carefully, I confess that it led to a change in my opinion. I found that the place where the largest leak occurs, the place where the largest share of the money paid by the consumer of these staple products goes, is to the place where they are retailed and distributed. This is, perhaps, not true in this village, but in the great markets of the land, which finally fix the prices we get for our products, it is the fact. I ought to state in explanation that these charts do not belong to any particular locality, but are made up on the principle of general averages. The conditions are not the same for wheat grown in Michigan and for wheat grown in Minnesota or Dakota; and so with the butter produced in Maine and Vermont and in Illinois. In order to get at general truths we have to make sweeping statements, such as I have made here to-day. We must get the averages of the great markets of the country to get at the facts which have been condensed in the form of this illustration. In making up these charts I have taken eight principal shipping points for each of these staple products, in the regions where the greatest shipments occur, starting, for instance, with what was received for wheat in Virginia, Missouri, Illinois, Dakota, Minnesota, &c. And then to get the price which the products ultimately sell for I have taken the average price for a year in five of our great retail markets, such as the Quincy Market in Boston, the Washington Market in New York, the principal market in Washington, and in either Cincinnati, Chicago or St. Louis. The making of these charts has been done very accurately and creditably, as I believe, by one of the graduates of your State College, who is my principal assistant at Houghton Farm in all of my work. Notice these black sections at the foot of each of these columns. Here we see the part of the dollar which must go back to the farm unless we would sell a part of the farm with the product. See how much larger part of the dollar is represented by that item in the case of flour than in any other of the articles. For every dollar's worth sold from the farm he must put back ten or eleven cents' worth onto the farm or else his farm is running down. This item varies with the different products, and in the case of butter we see that practically nothing in the way of fertility is sold from the farm with it.

Question. I wish to ask in relation to the enormous milk production of the cows that the speaker has mentioned, if he thinks it is practicable for the common farmers to reach such figures with their stock?

Maj. ALVORD. I doubt if it is at all practicable to reach these extreme figures, or if it is advisable to do so if practicable. But by extremes in both directions we have fixed upon our attention, better than otherwise, the medium possibilities. And the extremes of what has been done at the top are no more striking than the miserable failures that so many people are satisfied with at the bottom. While I doubt whether a herd of cows averaging fifteen or eighteen thousand pounds of milk a year can be maintained with profit by most farmers—and the collection of such a herd is hardly possible in a short lifetime—I know of a good many cases where men have, without the investment of large capital and within a few years, actually doubled the milk product of their herds; and they have been led to do this by the incentive given by some single cow or a few cows in their neighborhood, which they saw and knew of as doing so vastly better than their own average. I do not know what the average herds of your milk-producing cows are doing in this vicinity. I do not even know whether you depend upon keeping up your milk supply and maintaining the herd by breeding and reproducing from your own animals or by purchase, selling cows to the butcher as fast as they cease to be profitable as milkers. But whatever is the case I presume that a dairyman is pretty well satisfied with a cow that will yield six thousand pounds of milk in a year, two thousand eight hundred to three thousand quarts. I suppose there are men here who have herds which average from six to seven thousand pounds of milk for every animal they have for the 365 days. That is the way to measure it. It will not do for a man to say, "Here are two heifers which we will count as one cow, and here are two old cows which we will call one cow," so figuring twelve animals down to ten to get the average of their milk product, when he is feeding twelve animals. And yet that is a very common way of doing it. I say if there are milk producers here who are getting from six to seven thousand pounds of milk per year for every milk animal they are feeding, I presume they are pretty well satisfied with their product. I think they ought to be, whether they are or not. I know of whole herds of from ten to twenty and almost up to thirty cows in the neighborhood of Syracuse, New York, whose product did not average five thousand pounds to a cow fifteen years ago that are now producing an average of eight thousand pounds of milk per cow, as shown by the books of the factory to which the milk is taken. That additional three thousand pounds per cow is clear gain. My own herd is a Jersey herd. I do not believe much in the production and sale of milk myself. I live in the greatest milk-producing county in the United States, I suppose, the county of Orange, where milk production has been the main business for years, and I can get all the results of experience I want from my neighbors, sometimes more than they are willing to tell me; but I am convinced that there is no salvation for the farm that I have charge of in the sale of milk at the prices that rule there. So I am butter making. In our herd of butter-making stock I have two cows that are giving right along from eight to ten thousand pounds of milk a year, and milk of which ten quarts at any time, and often six or seven quarts, will make a pound of butter. I haven't a whole herd of that sort and never expect to have; but these extreme instances, I say, show us what is possible. If we own a cow once in a while that goes way above anything that we ever handled before it is an encouragement to us to try and get others; we know there must be another one somewhere and we go to work to get it. That was my purpose in introducing the figures I gave, rather than to convey the idea that it is possible for us all to collect such herds. And yet I don't know as I ought to say that. Perhaps I am too conservative on the subject. What man has done man can do; and it may be that we can increase our milk production beyond what we would believe possible. I believe fully that by culling our cows, by getting rid of the poor ones that take the profits right off from the good ones, we can nearly, if not quite, double our product from the same number of cows. And that will be done more by getting rid of those that are clear below the average than by getting so many animals that are very much above it.

Mr. True. I would like to ask the speaker if he cannot give us some further information as to the comparative advantages of selling milk and making butter?

Maj. ALVORD. Nearly all of you remember well when Orange County, New York, was the great butter-making county of the country, and when Goshen butter was at the top notch in the markets of the United States. It was the main product of that county, and no other such territory in the country approached it in its butter production. From that they drifted to milk selling. For a few years, while the demand exceeded the supply, it was a very profitable business. The prices received were such that the producers could well afford, whether they did so or not, to sell their milk product and set apart a good share of their receipts to return to the land in the way of fertilizers, thereby maintaining a reasonable degree of equity between the farmer and his farm. But, as always happens in such cases, the supply soon caught up with the demand. It doesn't take a great deal to flood any milk market I know of in this country. It is soon overdone; reaction takes place, as it did there, so that for a good many years the most careful milk sellers in Orange County assert that they have actually been producing and selling milk at a loss; that, at all events, probably the actual income and outgo shows a balance the wrong way. They can see, as everybody else can, a difference in the productiveness in the farms of Orange County at the present time from what they were ten or fifteen years ago. So that the tendency on the part of careful, thinking farmers at the present time is to go out of milk selling, and, in my immediate neighborhood, to return to butter making on the co-operative plan, or to sell cream, which, near enough to New York City, is a very excellent business. The value of skim-milk is certainly something which is very generally under-estimated. Although I think, speaking in a general way, that the experience of a large community, and what men have been taught by their life work, extending through a number of years, is better testimony than a few figures, yet there are a few figures on the subject which could be made in a little time, which ought to be fairly convincing.

Let us suppose a cow that gives 5000 pounds of milk a year, 2400 quarts. That is a pretty good cow. What can we expect to get for it? A cent and a half a pound is more than we can get for it in Orange County, but suppose we call it that. That would give us $75.00 for the milk of a cow for a year. Now, of every dollar of that, 4 7–10 cents comes from the soil. So we have $3.50 to come out of our $75.00, because it must be returned to the soil. That leaves $71.50 as the return for the sale of the milk.

Now, how much butter will that cow produce? I believe that milk that is worth buying, and not worth selling, ought to be good enough to make butter from; and I believe it will not be long before, in every great market in this country, milk will be sold, not for so much a quart, no matter where it comes from or how it is made, but according to its quality, and that there will be some way provided by which people can find out quickly the real quality of the milk they buy. That is nothing more than business. When the necessity comes for a new thing in this country we find a way to get it. I believe the time is close at hand when there will be some quick method by which any buyer will be able to satisfy himself as to the quality of the milk. We do not buy milk for the large percentage of water there is in it; we buy it for the food it contains. Hence there is going to be some way by which the consumer is going to tell what the food quality of the milk is, and upon that is going to depend the price paid for it, and a quart of milk will not always be sold for the same price. What I intended to emphasize was that if we compare these two things we must compare the same article of milk, milk from the same cows. Suppose that this cow that produces the 5000 pounds of milk is producing a good article of milk, milk from which we can make a pound of butter from every 25 pounds of milk. That isn't very good; I wouldn't have such a cow in my herd; I couldn't afford to keep her.

Question. How many pounds of milk does it take from your herd to make a pound of butter the year round?

Maj. Alvord. About 17 1-2. I will not have a cow that gives me an average of less than a pound of butter for every 20 pounds of milk the year round. That is my standard. If a cow don't come up to that I can't afford to keep her.

We will say 25 pounds of milk to a pound of butter. Dividing the 5000 pounds by 25, we get 200 pounds of butter as the product of the cow in a year. That is too little really, and you have no business to keep such cows. If I have a cow in my herd that doesn't make 250 pounds of butter in a year I cannot afford to keep her. I have generally succeeded in getting 300 pounds. I shall not be satisfied till I get 365 pounds of butter for every cow, a pound for each day in the year. When I get there I will put my notch up and try again. I think it will be fair to fix the price of the butter at 25 cents a pound.

These figures would give $50.00 for the butter and $71.50 for the milk. These figures would show a large margin on the side of milk selling.

Sec. Gilbert. You have made no account of the skim-milk.

Maj. Alvord. No, that is the next thing. This is the product sold. Now the question comes as to what you are going to do with the skim-milk. You could go right out and sell the skim-milk, but that would be just as bad, so far as the loss of fertility to the farm is concerned, as selling the whole milk; because it is in the skim-milk that most of the fertilizing elements are found. If you sell only the butter there is practically nothing to be subtracted on account of loss of fertility. If you sell the skim-milk there is a subtraction to be made on that ground.

Question. Shouldn't that 5000 pounds of milk make more than 200 pounds of butter?

Maj. Alvord. I think it ought to, a good deal.

A Farmer. For the last year it has taken 20.16 pounds of milk to give two inches of cream, and it has never taken quite two inches of cream to make a pound of butter when I have churned, so I think you should allow not more than 20 pounds of milk for a pound of butter.

Maj. Alvord. You don't sell that milk. I was taking milk that you would sell. The cash income in one case is $75.00 and in the other $50.00. From the $50.00 nothing need be subtracted as a debt to the farm. In the other case there is a debt of $3.50 to the farm which must be subtracted from the $75.00, which debt I am afraid is paid in very few cases. Now we have remaining this quantity of skim-milk, which has a peculiar value of itself. Out of the 5000 pounds of whole milk there will be, say, 4,400 pounds of skim-milk remaining after the butter is sold. The question is what value shall we give to that. It has a market value; it has a value as a feeding stuff, and it has a fertilizing value on the farm. I think the obligation of the butter-maker is to use his skim-milk so that it shall be as productive as possible, the same as he uses his cream. Skim-milk as a feed has a variable value according to the class of stock to which it is fed. On the farm that I have charge of we have a fixed value for the skim-milk for feeding purposes, and that value is one cent a quart, which we think low. As a feed for calves, pigs and poultry, we have found skim-milk to be worth a cent a quart. With poultry we have found it to be worth nearer two cents than one. It is the cheapest food we can supply to poultry even if we had to pay a cent and a half a quart for it. In point of fact I do buy skim-milk of my neighbors and pay a cent and a half a quart for it in large quantities through the year, and believe I get my money back. Suppose we take it at one cent per quart. Skim-milk is heavier than new milk, and every two pounds make a quart. So for our 4.400 pounds of skim-milk we will have $22.00 to be added to our $50.00. That gives us $72.00 as our total return under the butter-selling process, against $71.50 under the milk-selling process. If we should increase our butter product to 250 pounds per cow it would probably mean better feeding than she is getting now, but it would add $12.50 to our receipts, making the return from the butter sold $62.50.

Question. Would it take any better feeding to make 250 pounds of butter than 5000 pounds of milk?

Maj. ALVORD. That depends a good deal on the cow. No, I think any well-selected cow that is fed so to bring her milk capacity to 5000 pounds would be very likely to give milk twenty pounds of which would make a pound of butter.

And here is another thing which has been entirely left out, but which I think should be taken into consideration. If you are at work on this plan of butter making it is probable that you can use the same cow through her natural life. If you are selling milk and running your herd to its maximum for the production of milk, then your cows will wear out comparatively soon and you have got to replace them by purchasing other cows under the fluctuations of the market, and you become a speculator instead of a conservative producer. In our vicinity when we go out into the outer world to buy milch cows to take the place of those that are giving out we are running a very great deal of risk. The cows that are brought into our county every month by the car load we consider a standing menace to the health of our herds; and I am awaiting in fear and trembling the day when we will have half our herds swept off by an outbreak of some contagious disease, introduced by cows brought in we do not know where from, but only that they will give so much milk.

Question. In those cases where they feed their cows to that extent that they wear out in a short time, are those farms losing in fertility by the selling of milk?

Maj. Alvord. Where the effort has been made to continue general farming, and to produce, as they did in the old times of butter making, all the food for the support of their cows, the farms do show manifestly that depression. Where they purchase liberally food to produce their milk they are, of course, fulfilling just this obligation which is indicated by the black section at the foot of each of these columns, and bringing onto their farms in food, an equal amount of fertilizer to that which they carry off in milk. And those who have pursued that plan of high feeding by the purchase of food are the only ones who have progressed in the milk-selling communities. In that way they succeed. That is as good a way as any that I know of to keep up the fertility of the farm, if it is faithfully adhered to. But there enters another element into the business. I referred to the system of handling a certain herd of cows upon the same farm substantially in the same way, in the one case selling milk and in the other case selling butter; that way being under a system of general farming, where an effort is made to support the herd of cows from the products of the farm. Of course I allude to territory where we have to feed the land and replenish it, and not to any region where nature supplies sufficient fertility for a number of generations.

W. W. Harris. It seems to me that some things have been demonstrated here by Mr. Alvord that are very plain to the farmers of this town. This town has done as much, perhaps, in supplying the city of Portland with milk as any other town in the State. Now, you all know very well that when there was no competition you were at the mercy of the milkmen of Portland. They fixed your price and they told you how much of your milk they would take: if you sent a few quarts more, if they didn't want it they wouldn't have it; if it was sent they would send it back. To-day you find a different condition; your price is higher and they haven't got it all their own way. You have a butter factory here and some of you men who do not patronize it do not realize what it has done for you. It fixes the price that these men in Portland have to pay you for your milk. Another thing: Where you sell your milk you have nothing to raise calves on. If you are in the butter-making business you can raise your calves. I make it a point to raise all my heifer calves. I sold 22 cows last year from my farm from February to April. I raised every one of them on my farm, and it is not a large farm either. I used to sell milk, but I have changed over to making butter and I can now raise calves and pigs where I could not do so before.

Another point which the speaker has demonstrated, and a very important one, is the great difference in the amount of fertility we remove from our farms under the two systems of butter selling and milk selling. In the case of butter selling practically nothing goes away; in the selling of milk quite a perceptible amount is carried off; and, as the speaker has said, the tendency is to forget to return it.

Maj. ALVORD. In that connection let me state that for three years now the milk question has been paramount in the county of Orange. We had a milk war there; and we have been agitating the question of what was to be done to re-establish prosperity among those who had their whole capital invested in the production of milk. After a number of debates this winter, in the meetings which are held fortnightly and which are attended by three or four hundred of our representative men, the conclusion has been reached that there can be no method so safe as to provide the milk producers of that county with some means by which they can, when they want to, withhold their milk from the milk market and manufacture it. A company is now being organized in the county with large capital, to erect and equip butter factories in different sections of the county, so that they shall be always ready. We cannot expect the county to go back to dairy butter making again. Where farmers have escaped from the drudgery of that they are reluctant to take it up again. But these factories distributed throughout the county we believe are going to be in the nature of an insurance to the business. Some of them will be more or less patronized all the time, while others will be used whenever it is necessary. We have had it flung in our faces there for several years: "Your old churns are dried up and tumbled to pieces, and you cannot take care of this milk at home; we know you are obliged to sell it; you keep it back a few days and see how you like it; you will come around again and ask us to buy your milk." The dealers in the city have it their own way. If a man withholds his milk it will spoil, and in a few days he will ship it to the city again and take what he can get for it. These butter factories will take up the surplus milk in their vicinity at all times, and at any time when it is necessary to make a little point in the business, to administer a little admonition, they are capable of taking care of nine-tenths of the whole milk product of the neighborhood and dispose of it at a fair price, without its going into the city at all. The mere agitation of this subject within the last month has caused an advance of half a cent, which the milkmen themselves have conceded to the farmers of Orange County, which amounts to $150,000 on their sale of milk for the month of January. This has been brought about simply by the knowledge of the fact that we are putting up these factories. One is building now within a mile of our farm. After a very careful computation and figuring of all the ins and outs, which would be impossible to make off hand, the conclusion has been reached among our farmers that there is really not sufficient profit in selling milk, year in and year out, in the long run, to induce any one to go into the business or to continue in it, unless the price will average very nearly, if not quite, four cents per quart the year round. Then he can afford to put back onto his farm all he takes away from it in selling the milk.

Question. What is your measure?

Maj. ALVORD. Wine measure; forty-quart cans being the usual shipping vessel and the market price being always so much a can.

Sec. GILBERT. I do not propose to intrude myself upon this audience to-day to any extent, shielding myself with the satisfactory excuse of having provided sufficient material to occupy the time to better advantage. Perhaps there may be a word or two said in further consideration of this important matter. For the reason of the importance of this matter the Board of Agriculture has from time to time, in the last two years, dwelt at length upon the importance of stock husbandry among our farmers, and has urged them to increased attention to this branch of our business, for not only the present profits but for future advantages. The lecture this afternoon, coming from the source it does, and with the authority it does, has been a great satisfaction to me in corroboration of the position that the Board has more feebly endeavored to maintain in its past action. Especially applicable here is the question of stock husbandry in the form of dairying, and in encouragement of the butter side of the problem I would add a few words. And first by way of criticism of the figures presented by the speaker of the afternoon. While he has given the butter side of the problem low figures, he has given the milk side of the problem figures which you never have been able to reach, and probably never will be able to reach in the future. Thus the butter side of the question has been placed under a disadvantage which does not belong to it. Of course where so small fractions are involved in comparisons made between a pound of milk as devoted to sale or to butter it is necessary to figure fine and it will not answer to omit the small fractions on either side. Two years ago the Board of

Agriculture endeavored to investigate a comparison of the two kinds of work, and to do it candidly and in a manner which would certainly carry with it the evidence of honesty; and from the best information that could be brought to bear upon it there was but little choice in the money returns from the milk as devoted to either purpose when a proper value was placed upon the skim-milk. You will find a report of that examination in the report of the Board of Agriculture for 1883.

I wish the speaker would dwell somewhat more upon the prospects for the future of butter making in the associated method. We have gone but a little way in experience here in this State. We are meeting some very serious obstacles, and we are finding some discouragement among farmers. Farmers very quickly catch hold of any discouraging features that are attached to the business. At the present time the bogus butter matter is a serious one to consider. Some of our farmers who are somewhat weak in their faith in the business are beginning to conclude that it is to be still worse for them in the future, and that, after all, the business of butter making by the associated system doesn't hold out the inducement which has been claimed for it in our efforts to establish it. I think their conclusions are erroneously drawn and I would like the opinion of the speaker on the point.

You will see that the price that the speaker has given to butter in his calculations, 25 cents a pound, is really a low one, and one which your factory here has been able to exceed considerably when you average your work by the year; in fact, I believe even your low summer sales have not fallen below that figure. The fact that we are not receiving better prices for our butter at the present time is from the fact that we make so little of it; that we haven't made a mark in the markets sufficiently large to attract the attention of large buyers. If we could increase our product vastly we should stand a better chance in the large markets than we now do in the matter of sales. It has been established beyond question that we can make good butter in the State of Maine—butter that suits critical markets and butter that sells for a fair price. We have only to persevere in the business in order to do still better than we have in the past. This opinion of the business is made up from a close and careful examination of the subject. I was glad that your member of the Board of Agriculture referred to the matter that you here should consider that you are receiving larger prices for your milk than you would have obtained if the butter factory had not been in existence. If the butter factory has brought you in these better prices for the milk, certainly as wise men you will not be disposed to desert that which is bringing you your profit.

As to the price, I appeal to you all if butter the past year and through this present winter isn't one of the highest valued products among us in proportion to its cost. You will bear in mind that we are running through a season of general low prices; and yet these extremely low prices have not yet touched the dairy products, especially butter. We are obtaining this present winter what if we were consumers we should think an extravagant price for butter. Other provisions are down to an extremely low figure. We should not, therefore, take discouragement from the somewhat lower prices that we are obliged to satisfy ourselves with this year. As the speaker whom we have here this afternoon was one of the first advocates of the introduction of the creamery system of butter making in the Eastern States, and of course is thoroughly conversant with the matter at the present time, I would like to submit the question to him of the outlook for the future of the creamery product as compared with private dairy butter.

Maj. Alvord. Let us understand what we are talking about. I was yesterday dining at a place where we had some very good butter on the table. and I asked what it was and where it was made. They said "It isn't factory butter, but creamery butter;" I asked what they meant. The reply was that this butter was made on Mr. so and so's farm and he had a creamery. Now that isn't my idea of creamery butter at all.

It doesn't make any difference what you use in making butter on the farm, whether you use an open pan, a deep open pail or a patent creamer. That is dairy butter that is made at home on the farm, it doesn't make any difference in what way. You may bake your bread in an old-fashioned Dutch oven, in the coals, or in a brick oven, or in a modern cook stove or range; it is home-made bread. If you say your stove was a first-rate baker, and consequently all that came out of it was bakery bread, folks would laugh at you. So they ought to when you say you have a creamer at home and all the butter that is made from it is creamery butter. It is dairy butter if it is made on the farm. Creamery butter is the product of an aggregation of a large number of cows' cream brought together and manufactured in one place. The greater the number the more completely it exemplifies the creamery idea, because the point is this: that where the cream of a large number of cows is made up at one place the law of average comes in to make the cream of a large number of cows, as a whole, just about the same the year through; that is, there will always be about so many young cows and so many old ones, so many fresh and so many nearly dry. That is the western idea of the reason for the uniformity in the butter from the factories. That is the market distinction.

The distinction in the market to-day between dairy butter and creamery butter, and the difference in price, is very much greater than it was a few years ago. This margin is widening between the two instead of narrowing. I know when I first began to talk about butter factories in Western Massachusetts people said, "That is a mere fancy; it is fashionable now to have this creamery butter and so folks pay a little more. Dairy butter is really just as good and it will not be long before it will sell at the same price." When we began to sell creamery butter from the factories of Western Massachusetts and New York in the New York market it was still classed as dairy butter; they wouldn't believe we had factories. But now you find in the New York quotations that the productions of the factories of New York, Pennsylvania and Western Massachusetts, stand at the head. The creamery butter of Ohio, Illinois and Iowa comes next. Nearly as high in some cases rule the products of eastern factories. It is a big drop from them to what we call the best State dairy—the best butter that the favorite private dairies of the State of New York produce. When I first began, five or six years ago, to advocate butter factories there was only a difference of about four cents between the best dairy butter and the best creamery butter. But that margin has been increasing ever since. Look in any paper that gives the Boston and New York market quotations at the present time and you will find the price of the best creamery butter is 37 or 38 cents a pound, and it has been 40 within three weeks.

About two weeks ago I had occasion, at the request of a friend of mine, who had been disappointed in a supply of butter for a large boarding-house, to buy some butter for it in the New York market. I bought the best fresh-made dairy butter that could be found on Chamber Street for 23 cents. There was a difference of 14 cents a pound in that store that day between it and the factory butter made in the same neighborhood. That tub of dairy butter was just as good as the creamery butter, and I had just as lief have it on my table. But that single tub when it came into the market had to be stripped; they took the butter all out of the tub and examined it all the way through, because, they said, ten to one the butter was not made from a single churning and it will differ in different parts of the tub. Every package of dairy butter that comes into the market has to stand an examination by an expert at a cost of two or three cents a pound, while factory butter, which may be no better, is sold on its reputation without having been seen. It is always found to be the same; so the merchants prefer it. And the margin you can safely say in the eastern markets generally ranges from 12 to 15 cents in favor of the factory-made goods. That will make the butter and leave a profit of six or eight cents besides.

To answer the question now more directly. It is my business to study this matter; I try to keep track of it; and it looks more and more every day as if the product which the market knows as creamery butter was holding a place in our home and export trade which cannot be shaken, and as if every day that passes in the future would make more or less of an addition to this wide margin between creamery butter on the one hand and dairy butter on the other. And it looks very much as if dairy butter was going to the wall, simply from the fact that people are not going to give enough for it to make it any object to produce it. Private dairymen are going out of the business into some other line of work. If they cannot get their butter made at the factory they are going to let the cows go. There isn't much margin left now on dairy-made butter in any of our eastern markets as a rule.

SOMERSET COUNTY.

Institute at New Portland.

An Institute for Somerset County was held at West New Portland, by invitation of New Portland Grange, January 29th. The attendance was large and a deep interest was manifested in the programme. Geo. F. Moore, the member for the county, presided.

In the forenoon, Prof. Balentine of the State College gave an illustration of Farm Book-Keeping, which will be found in connection with another institute.

The afternoon was taken up by the reading of a paper entitled Lessons from the Farm, by Hon. R. W. Ellis of Belfast, followed by a discussion in which C. H. Cobb of Poland, an ex-member of the Board, took the lead; and in the evening a paper on Farm Wastes was read by Mr. A. I. Brown of Belfast, and another on Poultry by Dr. G. M. Twitchell. The Institute was successful throughout.

FARM WASTES.

By A. I. Brown, Belfast.

It is hardly worth while to enquire whether the old saying, "A penny saved is two pence earned," is true or false. It is safe to say that a rigidly sensible economy is the crying need of the times here in Maine. It is one of the keys to the situation. It is evident to close observers, that other men in other business pay greater attention to wastes than do farmers. In a practical manner I propose to discuss some of these which common prudence and common business principles alike demand should be stopped. I do not claim to have made any new discoveries, nor do I assume that I am able to present new ideas, even, but I hope to induce a thoughtful consideration of the subject in different aspects from the usual ones, which may have some effect upon the status in which we find ourselves.

The figures and statistics which I shall use are mainly for Somerset County, and are taken not to make any comparisons invidious to this part of the State, but simply in order to bring the subject to your very doors. Somerset is second to none and I am proud to do her justice.

There are 4,500 farms within her borders, large and well stocked. It is safe to say that one mile of fence to each is a moderate estimate. This would fence 40 acres in a square plot without any cross fences. Reckoning the cost of this fence at 70 cents per rod we find the cost to be, in round numbers, $1,000,000, or one-twelfth the valuation of the county. A recent writer estimates two miles of fence per farm for the State at large at one dollar per rod, making the cost of fences $35,000,000, while the value of all our live-stock is but little over $12,000,000. It seems to me that this estimate is too high, but at all events, when we consider the actual first cost and the vast annual expenditure of money and labor required to keep fences in repair, we may well denominate the maintenance of more than our necessities demand as waste. The practice of keeping up useless fences probably originated when the farms were being carved out of the primeval forest. The improved land at that time being enclosed to keep the cattle out. I sometimes fear that some of us have "kept in the rut," never thinking that times have changed.

There is also a waste in building expensive fences. How many monuments of human folly, in the shape of stone walls six feet or more in thickness, are to be seen in a day's ride in some sections. Such land had better be left for forest. The great point or problem is to do as little dead work as possible in this direction and direct our labor and skill into a channel that shall bring returns.

In my estimation the most gigantic and at the same time unpardonable and impoverishing waste on the farm is the waste of manures. The soil demands a certain compensation for its favors, and appreciates prompt payment in currency adapted to its needs, of standard weight and fineness, and undepreciated. Manures are wasted by exposure, by misapplication and by over-heating through fermentation, or by fire fang, so called. Each of these means of waste is a topic worthy of a lecture in itself. There are other deductions made from its value, but as they are not so general I will confine myself principally to these in a general way. In order to appreciate what we are losing annually in the strength and value of our fertilizers at the barn, let us make an approximate estimate of what manure is worth, not in dollars, but simply comparatively. I think few farmers fully realize the immense importance of utilizing the entire resources of the farm in view of making returns to the fields for the crops taken off. This may seem like a random statement; but go where you will on a day's ride through the country at this season of the year (February) and mark the farms where there are no provisions made to protect the manure heaps from the winter snows, the drenching rains, the sweeping winds and the drip of the eaves. More and worse than all this, the barn-yard is often drained by surface drains or by being on a slope, and the most immediately available part of the manure is washed away, sometimes upon the farm where it is not needed, or where at least it is the poorest economy to apply it in that manner, but oftener it washes away over frozen surfaces into the brook, into the road, and practically out of existence.

The average hay crop of Somerset County is not far from 105,000 tons. This hay crop takes out of the soil about 1,785,000 pounds of phosphoric acid. To replace this by purchasing commercial phosphoric acid at nine cents per pound which is the experiment station valuation would cost $160,650. To replace it by use of barn-yard manures would require the application of 59,500 cords. The potash taken would be about 3,622,500 pounds, which if bought in the market would cost $262,631, and if replaced by manure would require 115,000 cords. The nitrogen would be about 1,365,000 pounds, costing $245,700 and requiring 35,000 cords of manure to put it back. This is the depletion by the hay crop alone. When we add to this what is taken by the 92,545 bushels of corn; the 46,846 bushels of wheat; the 273,438 bushels of oats, and the other farm crops of various kinds, we become aware of the drain which the farms of this county and every other county is sustaining. It must be remembered in this connection that the figures which I have given are only approximate, inasmuch as they would vary somewhat in different varieties of hay. It must also be remembered that the manure which I have mentioned as going to replace the different plant foods is well-housed manure that has undergone no waste. That part of manure which is immediately available as plant food is of course readily soluble. Now, being thrown out in small quantities daily, if exposed to rains a very large percentage must be lost. Allowing that none were lost, and that all the crops raised were to be fed on the farm, there would be still a considerable less quantity of these three great fertilizing elements returned to our fields than were taken off, unless we purchase more or less feeds. I believe nature intended that cultivation and the action of her mighty yet silent forces should yearly liberate enough of the otherwise now available plant food which is in all soils to balance what will be lacking between the crop and the manure without waste, and that she punishes us for wastefulness by scanty crops and worn-out farms.

It is impossible to determine the money value of manure with any accuracy. The value depends upon the kind of feed which the stock consumes and somewhat upon other conditions. Taking the average of several tables of analysis, I find that three tons of green manure, which has been properly sheltered, contains phosphoric acid 30 pounds; potash $31\frac{1}{2}$ pounds; nitrogen 39 pounds. Reckoning experiment station valuation for these ingredients we find the value of three tons of green manure to be $12.08. This estimate is only valuable as going to show the folly of wasting manure and buying phosphate or chemical fertilizers. If to this estimate we add the profits of the manufacturer and middleman, our three tons of manure are comparatively worth at least $15. If we lose not more than 10 per cent of the vast yearly product it is an enormous loss, not only in the present, but prospectively.

Thus far we have considered the solids, so called. We now come to the liquids. The best authorities state the annual amount of liquids from various animals as follows:

Horse	3,000	pounds.
Cow	8,000	"
Hog	1,200	"
Sheep	240	"

Dana has carefully estimated the liquids from a cow to be nearly two-thirds as much by weight as the solids. I have been able to find no reliable data as to the proportion in case of other animals. Two facts arrest our attention just here: First, the liquids contain nearly all the potash and if lost the solid is a one-sided fertilizer; Second, in the liquids we have a large per cent of the soluble parts of the manure that might act immediately upon the young plants.

To throw still further light upon the value of liquids, of themselves and in comparison with solids, I will quote the analysis given by Dr. Nichols, who analyzed the solid and liquid from his own cows.

ANALYSIS.

In one thousand pounds.	Solids.	Liquids.
Nitrogen	5.11	17.5
Potash	2.00	15.0
Phosphoric acid	3.55	10.1

In view of the above facts, and from my own observation, I have no hesitation in saying that on many farms at least one-half the fertilizing power of manures is lost—wasted away. How can it be prevented? Our barns should be built over a cellar, so constructed as to keep water out as well as to hold what is put into it. Where the location or the means of the farmer will not admit of a cellar a shed joined to the barn and having a large water-tight vat within, will serve a very good purpose. I would have this vat the whole length of the shed and four feet deep. It may be made of plank fastened to timbers and should be backed up with stone to prevent the frost from injuring it. I would have the shed wide enough so that there may be a platform at least six feet wide, and sloping slightly toward the vat, built between it and the outside of the shed. The manure can be thrown from the vat to this platform, at leisure or convenient times and the drainage will return to be taken up by absorbents. Gutters can be arranged leading from the tie-up, and there need be but little loss. Such a shed need not be costly, and is within the means of the most of us. The economy of using absorbents about the barn is generally admitted and understood. There is, however, one point in this connection which appears to me to be of importance, and which is but little considered. In hot weather especially, and to some extent in all seasons, nitrogen passes off into the air from damp stable floors behind our horses and other stock. I cannot state what the loss is, but nitrogen is too valuable to go to waste. I usually keep a cask of plaster about the barn and use a little often. I think it pays, and it is a deodorizer in no small degree. The vaults, the sink spout and every other place where plant food is, or where it is liable to be lost should receive our careful attention. Good farming, good crops, and good economy demand it.

Probably that waste which stands next to the waste of manures, in magnitude and importance, is the waste in feeding stock. There are in Somerset County 8235 horses and colts. These animals are fed in the barn we will say from November 1 to June 1, a period of 212 days. Suppose they each waste one pound of hay per day, it amounts to about 873 tons, at $12 per ton is worth $104.76. I presume the waste is more than double that. Most people feed horses too much. The rule is to feed three pounds of hay for each 100 pounds of the weight of the animal. I believe this to be an outside estimate. Close feeders, as the horse-car companies for instance, say that this is high enough, but all agree that it is good economy to substitute grain for one-half this amount of hay. I know of a pair of 1100 farm horses that keep in good condition on fifteen pounds of hay and four quarts of corn and cob meal, each, per diem. If they were allowed to eat more than this it would clearly be a waste. I hold that over-feeding is the source of waste in horses, although there are some who lose in the other direction.

There are 119,221 sheep in the county, they are fed from the barn about 180 days. Suppose each sheep wastes one pound of hay per day. It amounts to 10,730 tons and at $12 per ton equals $128,760. Two pounds of hay per day is sufficient for any average sheep. A very simple and cheap device for weighing hay for rations may be made by suspending a piece of wood four feet long by the middle, to one end attach an equilateral triangle some five feet on a side, by strong cords fastened to each corner. To the other end attach a pail, box or bag containing rocks enough to balance the triangle and the ration of hay. Nail some laths across it to keep the hay from falling through and arrange so that it shall hang not more than two feet from the floor.

It is generally believed that cows pay for what they eat, and that full rations and even something to give them an appetite is no loss. The average butter product per cow, for the State at large, is something less than 150 pounds. There is no valid reason why we should not have cows to average 250 pounds. This is not an extravagant estimate. Now is it not practically a waste to feed ordinary cows year after year? Can we afford to do it?

As to feeding for beef, the day has gone by when money is to be made by feeding ordinary cattle in the primitive methods. He who attempts and persists in the attempt will waste his substance. There are in this county not far from 10,000 head of young stock. On all these which are of good breeds, and have been judiciously fed, there can come a profit, but on those who have no distinguished excellence for butter, cheese, milk or beef, there must be a loss and a waste of time and feed. Mr. I. C. Libbey of Burnham tells of a man who raised a two-year-old steer and sold him for $8 to a neighbor. Mr. Libbey bought him for $9, took him to Brighton and sold him for $12. There evidently had been a waste in feeding in that instance. I greatly fear that this is not an isolated case.

The subjects of dairying and that of beef production are too vast, too important and too complicated to be considered in this article. The above suggestions are given simply *as* suggestions pertinent to the subject of Farm Wastes. The time and space allotted me will suffice only to briefly enumerate some of the minor but still common wastes which are to be observed on every hand.

It is a waste of time, money, energy and manhood to engage in lawsuits. There is a waste or loss through misdirected efforts resultant from having no definite well-matured plans for future work. Not only should there be a plan, but a system. It is a waste to allow farm implements to lie exposed to the elements. There is a waste in neglect, not only to take the one stitch that saves nine, but in failing to prepare our soil in autumn as far as possible for the next year's crop. In the one case we are the masters of the situation, in the other the bondmen. There is a waste in neglecting sewers, cellars and vaults, until the fever or pestilence lays hold on the family. There is a sort of waste in buying what we might produce; in planting crops that do not pay; in planting crops not adapted to our soil; in paying no attention to rotation to crops and simple laws of nature; in clinging to old-fashioned, cumbersome methods or tools; in not putting our produce on the market in good condition, with honest weight and measure, and in neat packages; in careless selling and in reckless buying; in buying things we do not need, and buying at a disadvantage the things we do need; in clearing land of little value; in keeping farm stock in cold barns; in doing business without keeping accounts; in trying to till too many acres; in short, in trying to make our muscle a match for another man's brains and brawn together.

These are some of the real, the vital points which stand out conspicuously and sometimes painfully or reproachfully from the otherwise level field of agriculture. They are the points on which are hung so many dismal failures, which have shattered so many hopes, which have frustrated so many plans. They mark the boundary line between independence and dependence, between success and failure, between the domain of a master and that of a slave, between plenty, luxury and a noble sovereignty and a simple animal existence. A good example is contagious. We are an imitative people, and when once the ball sets to rolling, or in other words when those who exemplify good farming are to be found in every neighborhood, the scales will fall from the eyes of all as if by magic. The majority rules in other matters besides elections. When we cease to justify our own shortcomings by pointing to a more shiftless neighbor it will be the better for us. When we resolve to justify ourselves only when doing well we shall have entered the road to success. No doubt but that there we shall find the grades heavy, the ups and downs frequent, and the prospect often shut out by obstacles. But if we pay careful attention to the guide-boards, to the land-marks set up by the hand of labor, and to the imprints left by intellect upon the very stones themselves we need have no fears. It is inspiring to climb, it is brave to battle, it is noble to overcome, and sweet to lead nature captive and hoard our spoils in barn, in cellar and in granary. What if we do not achieve all that we hoped, what if the end fall far short of our aim? If we have made the way clearer, the task lighter for those who are to succeed us, oh, how soon! we shall not have lived and toiled in vain. We have somewhat profited by the labors of departed generations, why should we be chary of sowing for another's harvest? We are too transient to take an entirely selfish view of life. We are but units of the whole.

Let us imagine for a moment how much better our condition would have been had men lived less for men and more for mankind. From our standpoint we could have easily commended a less selfish view of life and its true requirements in our forefathers—then should not we do that which is commendable not wholly for ourselves but partly for posterity? There is one more aspect in which I wish to view the matter of wastes, and I close.

While there is an imperative demand that all wastes should be stopped and that all the various operations of the farm should be conducted on the strictest business principles and with the most absolute economy of material and labor, and with a constant care as to the most sagacious disposition of the resources of the farm there is still a danger that we finally carry this necessary frugality beyond its proper domain, and into the regions of parsimony, meanness and misers, where the eye sees naught of beauty, the body little of comfort and the intellect absolutely nothing; into the land of dilapidated fences, of unpainted houses, of tumble-down barns, of weary, sad-eyed wives, of unambitious, mechanical children, of sordid, selfish men, of a people whose souls should fill and enjoy a universe of beauty and delight, but which, oh pity! are circumscribed and covered by the rim of a pitiful dollar. Surplus funds come so slowly to the most of us that what we do in the earlier years of our business career by necessity, becomes in time too much a habit. This makes the danger stealthy, insinuating and powerful. I hold that there is quite as much waste exists, and as much wisdom required in spending money as in acquiring money. The old proverb maker goes further than this and says, "A fool may earn money but a wise man should spend it." One tendency in the past has been to acquire increased acreage with increased capital. Whatever may have been the reasons for such a course, as a general rule, I believe the practice to be wrong. More than 1900 years ago, Virgil, the Latin poet, summed up the whole matter in these five words, "*Laudato ingentia ruva* ; *colito exiguum*." "Praise large fields ; cultivate small ones." Not all the philosophy nor the practice of the world since then, nor has the enlightenment of the 19th century been able to shake the truth so tersely set forth. While there may be just pride in the ownership of large areas, and the poetry of broad acres reaching to the setting sun may captivate the fancy, yet—

A little farm well tilled,
A little wife well willed,

the moral and intellectual advantages, the comparative leisure, the peace, the luxury, even, the adornments, the embellishments, the natural and needful concomitants to rearing physically and mentally healthy children, in short, the model, ideal, truly American farmer's home is something beyond all price and worthy of any effort and any outlay. Its gradual acquisition is neither waste nor extravagance, but is the best thing that money can buy. It is the Utopian dream of every city toiler ; it is the ideal of the professional man, the statesman and the wanderer. The actual picture exists, to-day, as a beautiful reality in hundreds of our New England towns.

"These sweet homes nestle in these dales
And perch along these wooded swells ;
And, blest beyond Arcadian vales,
They hear the sound of Sabbath bells !

Here manhood struggles for the sake
Of mother, sister, daughter, wife,
The graces and the loves which make
The music and the march of life.

And woman in her daily round
Of duty walks on holy ground.
Then let the icy north wind blow
The trumpet of the coming storm,
To arrowy sleet and blinding snow
The slanting lines of rain transform ;
And I will trust that He who heeds
The life that hides in mead and wold,
Who hangs the alders' crimson beads

And paints the mosses green and gold,
Will still, as He has done, incline
His gracious care to me and mine,
Grant what we ask aright, from wrong debar,
And as the earth grows dark make brighter
every star.

I have not seen, I may not see
My hopes for man take form in fact,
Yet God will give the victory
In due time; on this faith I act;
And he who sees the future sure,
The baffling present may endure,
And bless meanwhile the unseen hand that leads
The heart's desire beyond the halting step of
deeds."

LESSONS FROM THE FARM.

By Hon. R. W. Ellis, Belfast.

We are told by most every one, that this is a very hard time for farmers, in fact that we are passing through a sort of "critical period." This to a certain extent is true. Prices of most all farm products are very low, and as our taxes and interest on what we owe do not decrease it makes it pretty hard for many of us to make the two ends meet. I believe if the lessons we are learning are profited by as they should be they will prove a great blessing.

We are told by many agricultural writers that it is the western competition that is killing us here in the East; that here on the sterile farms of New England we never can compete successfully with the fertile farms of the great West. Then, again, we are told that it is the railroad monopolists that are taking the life-blood out of us by charging twice or three times as much as should be charged for bringing these western products here. I admit we cannot successfully compete with the western farmer in the production of beef, pork and dairy products as long as we let him grow our feed for us, and we pay for transporting it here, for the reason that it takes from six to ten pounds of feed to produce one of beef; hence, the freight is from six to ten times as much which gives the western farmers just so much advantage. When we produce all the feed we use on our farms the western man has all the freight to pay himself, which I think will more than offset the natural advantages of his soil. Then we shall have no more trouble with the railroads for the more they charge those western fellows for bringing their beef and butter here the better for us.

Then, again, we are told by another class that there is too much competition right here at home, that there are too many engaged in agriculture in Maine. Can this be so, while we are bringing in thousands of dollars' worth of beef, pork, butter and cheese and a million dollars' worth of feed, corn and flour annually which we might just as well produce ourselves?

Then still another class tell us that it is the manufacture of "bogus" butter and cheese that is "playing the deuce" with us, and if that can not be stopped we might as well stop farming. We are told by another class, still, that the universal "Panacea for all our ills" is legislative protection for the farmers, and we are all advised to turn politicians and try and secure it.

As farmers, all we ask is an open field and a free fight. We ask no odds of any trade or profession. All we ask of the railroads is that there shall be no discrimination in favor of one class of merchandise and against another, and a pro rata price on all distances alike; and all we ask of the bogus butter maker is that he will sell it for just what it is. If any man has found a way by which he can manufacture a substitute for butter, it is his right to do it so long as it is not injurious to health, and if landlords, boarding-house keepers and heads of families prefer to buy it, it is their right to do so if they know what they are buying. If it works against me as a butter maker I must bear it. All the legislation that can be passed will not prevent it.

But before I proceed farther I wish to say a few words more about this western competition. It is true the western farmer has an advantage over the eastern in the much larger areas that he can cultivate without obstructions, enabling him to do his work more cheaply; and also in the greater richness of his soil, needing less fertilizers. To offset this he has to pay the expense of transportation from one to two thousand miles to compete with us at our doors, and I am satisfied that when the eastern farmer makes proper use of all the resources at his command he can successfully compete with his western rival; in short, that he can raise all the feed he wants for both man and beast more cheaply than he can buy it. Then again, the sweet grasses that grow on our rocky hill-sides and in our fertile valleys, together with our pure water and healthy climate, enable us, if we will, to produce an article that will outsell our western rival in any market in the world.

But in order to do this we have got to make use of all the knowledge we can get from both science and practice, from our own experience and that of others, and try all the experiments we can and profit by the experiments of others, for, as I said in the first place, this is a trying time for the farmers of New England, and he who is not up and awake, keeping fully abreast of the times, using all the best modern inventions and late improvements, keeping himself thoroughly posted in the markets so that he shall understand not only the cheapest way to produce, but the best time to sell, is going to get left; and the sooner the chronic grumbler, who has no love for his calling, but is constantly finding fault with everything in general and book-farming in particular, who follows in tracks of his father and grandfather before him, I say the sooner such a man quits the business and goes into something else the better; for he *may* succeed in some other calling, but it requires a man of brains, pluck and perseverance to succeed as a farmer.

The old saying that if a boy does not know enough to do anything else he might make a farmer has come to be completely reversed. Law and theology are all laid down in books, and when a man has learned what there is within that is all there is of it. It is true some men are keener and sharper than others and can make a better application of what they know. The science of agriculture is very different, and far more intricate. Some of the master minds of the world have spent a lifetime of study upon it, and have given us a great deal of useful information, but the man is yet unborn that has mastered the science, and can tell us just the constituents of the different soils and the plants that grow thereon, and just how to grow them to the best advantage.

But there is something truly fascinating about the business to the *real farmer*—to watch the growth of his crops and his stock and observe their tendencies and their needs and study how best to supply them. After he has followed it for perhaps fifty or more years, and feels that he must give it up to the boys, he then sees that he has just begun to learn, and thinks if he could continue twenty-five or thirty years more perhaps he would know how to farm tolerably well.

As I propose to give you my views as to the lessons we should learn from the present low prices of farm products, and as I propose to be as brief as possible, I must come at once to the subject. In the first place, let us learn that mediocrity is not the road to success; that competition is too sharp for common slipshod farming to succeed. When times are good and the prices of all kinds of farm products are high, an inferior article will sell for very nearly as much as a good one, but when there is a surplus and the market is dull it is only the best that will sell for anything like a remunerative price. So, in good times, when the farmer sells everything he has readily, and has plenty of money for all his needs, it is not much use to talk to him about better methods of farming. He is likely to say, let well enough alone. But when times change and all farm products are low, and his balance sheet at the end of the year shows a large balance on the wrong side; or, in the absence of farm accounts, when his wife informs him that the flour barrel is empty, and that she must have more sugar, coffee, &c., and he looks in his wallet and finds no money there, it is quite likely to set him to thinking, and when he has killed the cow that perhaps he has given a couple of bushels of meal and thinks is in tolerable good order, carries her to market and finds it impossible to sell her at all, and sees his neighbor at the market with a nice fat steer which he sells readily for 7 or 8 cents right through; or when he carries his summer's make of streaked butter to market and is obliged to take it from place to place and finally sell it at 15 cents a pound, when he knows some of his neighbors are getting 30 cents the year round, he is quite likely to begin to say to himself, this kind of farming does not pay; I must either change my methods or sell out and go to doing something else, or I soon shall have no farm to sell.

Now it strikes me this is about the condition in which many of us find ourselves to-day, hence the necessity of getting together as we are here, to-day, and, by comparing notes and getting one another's experience, try to devise a better and more remunerative way of farming.

While I do not consider myself in the least qualified to give instructions in farming, yet I am going to tell you what I think, and you can take it for what it is worth.

I shall start with the assumption that (except in particular localities, near good markets, where market gardening can be carried on profitably by a few,) not only the best but the only line of farming that can be carried on successfully and keep up the fertility of the soil is stock husbandry of some sort. Then, whatever kind of stock you decide to keep, whether beef, dairy, sheep or horses, keep only the best.

Feed whatever you keep, liberally. Raise all or as nearly all as possible on the farm, so that when you sell an ox or a hundred pounds of butter or wool, it shall represent the use of your land and so many days work and nothing more. Next provide yourself with the necessary implements to enable you to raise your crops with as little labor as possible. I will refer to these in the order that I use them. First, the manure spreader. Next to the mowing machine and horse-rake I consider the spreader the greatest labor-saving machine we have. No farmer can afford to be without one. I think it saves me at least twenty days of the hardest kind of work a year besides doing the work so much better that I think I receive ten per cent more value from the manure than I did from spreading it in the old way. It is one of those implements that a number of farmers can own together very conveniently. Next, the plough; and I shall certainly recommend a swivel plough of some sort by all means, as it leaves no dead furrows or back furrows, saves time in driving across the ends of the land, and oftentimes when the ground is soft saves injury to the grass. Next comes the harrow; and for mellowing the soil and covering the dressing I consider the disc harrow far ahead of any other I have used. There are four kinds in the market and all good. As to seed sowers and corn planters, I have never used them, but think from what I have heard of them, they are good investments. As to haying implements, they are in too general use to need any remarks by me.

Next, have all the requisites for making and saving all the manure possible. Of these I consider a barn cellar the best, very much so, but if you can not have that, next and what every one can have is a good shed to cover all manures. Provided with this and a deep trench behind his cattle, kept full of good absorbents, he can do very well. I am satisfied that the greatest waste of most farmers is in liquid manure. I am fully satisfied that with cows the liquids are worth full as much as the solids, and in some cases this is pretty much entirely lost, and in most cases a very large part is lost by not providing sufficient absorbents. As manure is the very foundation of successful farming on run-out farms, I cannot impress this matter too strongly upon your consideration. I consider dry muck the best for this purpose, as it is not only a good absorbent but a very good fertilizer of itself when properly managed. Dry loam or sawdust is very good. Sawdust has little or no manurial value of itself, but when dry is a very great absorbent. Leaves and straw make very good bedding, and when rotten make rich plant food, but are very poor absorbents. I think it a very good plan to mix horse and cow manure together, when it can be done conveniently. It helps absorb the liquid and keeps the horse manure from heating too much. When this cannot be done, always keep a hog under the horses, or their dressing will injure very much by over-heating.

I have very positive ideas on the time of applying manure to the soil. I consider from haying until the ground freezes up the best time, first, because you have more time then than at any other time of the year; second, your land is dry and hard and your team can draw a larger load without injury to the soil; third, it enables you to put in your crops in very much less time in the spring so that often times you can get in a number of acres of corn or grain when in good condition, when, if you had your dressing to put on in the spring you would possibly be delayed so long in many cases that you would nearly lose the crop; fourth, I think when manure is put into the soil in the fall and has the rains and melting snows to act upon it the crops derive very much more benefit from it.

As to manner of applying, I say plough under every time for corn or potatoes, and spread on top and cultivate in for grain or grass.

One of the most important points of all, and the most difficult to determine, is the kind of crops to raise in order to get the largest amount of feeding value and also have them follow one another in the order to best utilize all the fertilizing elements of the dressing. Here let me give you a bit of my experience: I used to farm mainly for grass, buying the most of my feed, but when I went into the milk business, keeping very many more cows, in order to keep up the flow of milk at all times, I found my feed bills were enormous and that I must try to raise what I could and thereby lessen the outlay. About that time I attended a Farmer's Institute at Thorndike and listened to an excellent paper by Mr. Holbrook, I believe, and argued very ably by Secretary Gilbert, entitled "Speed the Plough," in which farmers were urged to plough more and practice a system of rotation of crops, whereby they would get more benefit from their dressing than if applied to grass alone. It was an idea that I never had thought much upon and I believe I took some exceptions to it at the time, but it stuck by me and the more I thought of it the better satisfied I became there was good in it. About this time my oldest son went to Massachusetts to work on a milk farm, and he came home enthusiastic in the corn-raising business. He said that was their main crop for fodder. So I put that and that together and concluded to try corn raising, but in a very small way at first, only one-half an acre. But I liked it so well I have been increasing until I now have three acres prepared for next year's crop. In that as in most everything else I engage, I have experimented somewhat as to the best method of raising, and also of the feeding value of corn and cob meal as compared with other feeds. I took a piece of run-out grass land which was all alike, divided it into four parts. On the first I spread dressing on the sod and ploughed under in the fall. The second I ploughed and spread dressing on the furrow and harrowed in as well as I could in the fall. The next spring I did the same with the other two strips, then harrowed thoroughly, marked off three feet apart each way, put a tablespoonful of phosphate in the hill, and planted. I found the best result where the dressing was ploughed under in the fall, with less work in caring for crop, as there were less weeds and no dressing in the way in covering and hoeing corn. The next fall I ploughed it about one inch deeper and turned the dressing, with the old sod well rotted, to the surface to receive the next year's crop.

As to the feeding value, the same amount in bulk of corn and cob meal will produce more milk than three parts oats and one part western corn meal, and as much as two parts shorts and one corn meal. I am satisfied it is perfectly safe to reckon one hundred bushels sound ears to the acre, to be followed with mixed grain, oats and peas, or oats and wheat or barley. Of this it is safe to reckon forty bushels to the acre, which, when ground, makes fifty bushels of meal by measure.

Now these crops I feel safe to recommend to the farmers of Maine to raise as feed for any kind of stock, the same to be followed by three years in grass, making a five years' course.

The best method of curing our fodder in order to get the most feeding value with the least expense is an important matter. I cut up my corn as soon as possible after it has mostly glazed and stack it, and let it stand until the stalks are pretty well dried, then haul to the barn and husk. This is the largest job of the whole in raising corn. As fast as husked I put in a corn barn made for the purpose expressly, and it will not hurt if pretty green when put in. Bind up the stalks and set them up on end and they will not hurt so long as they stand upright. They will mould if they lie on each other, unless very dry.

The best time for cutting grain depends somewhat upon circumstances. If you want to feed the straw, cut as soon as it begins to turn, when the grain is in the tough state. If you want only the straw for bedding, I prefer to let it stand until the kernel is pretty hard, for I have no doubt that the kernel draws nourishment from the stalk until pretty well hardened.

There is a very wide difference of opinion as to the best time for cutting hay. I think that for milch cows, the best time is when it is in full bloom, and I think the same for fattening stock.

Now comes the matter of feeding stock—the most important of the whole, and I fear the least understood.

There are some farms on which the stock is fed by any and every member of the family who happens to go to the barn, sometimes eight or ten times a day, and then not more than two or three. We hope these instances are not very common now-a-days. Then there is another class, and I think a majority of our farmers, who calculate to feed all their animals will eat up clean. This seems a pretty fair criterion to go by. But let us examine a little. We know there are individuals among us who have such ravenous appetites that they do not seem to have control over them, and will oftentimes eat so much as to do themselves serious injury. Now, if man, who is expected to have a little higher order of intellect than the beast, will do such things, what may we reasonably expect of our dumb animals? It is true that some animals, the same as some persons, require more food than others. It is also true that some animals can assimilate and convert into milk or fat more than others; but it is not true that they are always the ones that will eat the most. I have frequently noticed that some of the most ravenous eaters were the poorest at the pail, and did not keep remarkably fat either, while others, more timid and with a more delicate appetite, can assimilate and convert into milk a very much larger amount, if it is fed to them and they have time to eat it. So I think the matter of feeding our stock so as to get the greatest returns from the least amount of food is one of the most intricate problems with which the farmer has to deal, and in its proper understanding and practicing depends, to a very great extent, the success or failure of stock husbandry in Maine.

A few weeks ago there were questions sent by a gentleman of Boston to a number of our leading stock men, asking the cost of rearing a steer to the age of three or four years and what they would probably weigh at that age, and I was astonished to hear the answer in every case "Don't know," and "Cannot give a reasonable estimate," "All I can do is to guess." Now it cannot be possible that all or any considerable portion of our beef raisers are doing business in that way. If they are it is not so much to be wondered at that some of them make the statement, as they have, that three pounds of beef can be produced as cheaply as one of butter. They are simply guessing, and they might as well guess that as anything else. This kind of business will do very well for rich men who go into the business for the pleasure there is in it, but the man who goes into it for a living and to lay up something for a rainy day must know when he sells a hundred pounds of beef or butter, whether he has made a dollar or lost one.

An experience of more than thirty years in feeding stock has satisfied me that sixteen pounds of hay per day, for the average dairy cow, is all that is profitable to feed. Some will want more, some less, which must be determined by observation and experiment. The rest of the feed should be made up of more concentrated food. A horse requires one and a half pounds to the 100 pounds of his weight to keep him in good condition when not at work; when at work, make up the deficiency in provender. Sheep of about 100 pounds each require about two and a half pounds per day, but if a little provender is fed will do with less. I do not pretend that these figures are absolutely accurate, but we weigh to our horses and sheep all the time, and have weighed to our cows enough to determine their wants very nearly. Sometimes their feed is weighed for months at a time.

I feed my grain all ground, corn ground with the cob, and feed eight quarts per day to a cow giving full flow of milk, then less, according to circumstances. We feed our horses usually four quarts per day of some kind of feed; when working very hard, give more. We feed our cows and sheep twice a day, horses three times.

We always fed three times a day all around until this winter, but I have come to the conclusion it is better to leave them from 9 A. M. until 4 P. M. to themselves, so that they may have time to thoroughly re-masticate their food.

We water all our animals, excepting sheep, twice a day. Many people contend that once is just as well. I had satisfied myself long ago that milch cows should drink twice, but this winter, thought I would test it again, so when my cows came to the barn I commenced watering but once and followed that until December and they had got well settled down to barn care and feed. Then I commenced watering twice a day, with all other circumstances precisely the same, and they immediately increased one pint a day per head.

Now this may seem so small as to be hardly worth naming, but in what I was milking it made a difference of fifty cents per day, which if saved and kept properly invested, would at the end of fifty years mark the difference between a man worth fifty thousand dollars and a town pauper. I only mention this to show how little of mismanagement or poor economy it takes in a lifetime to make the difference between poverty and wealth.

Another very important matter in the care of stock is the utmost regularity in all its details. Few people are aware of the loss they sustain by keeping their stock in a constant state of unrest and expectency. All milkmen know that when a cow from any cause is kept excited, uneasy or restless, it lessons their flow of milk. So beef producers know that the quiet, lazy, "happy-go-lucky" ox is the one you can work every day and he will still take on flesh, while the nervous, quick, fractious ox is very hard to make gain while at work. The same with the horse, the one that is inclined to be lazy, that will stand lots of whipping and not mind much about it is the one that will always be fat. Observation, therefore, teaches us that it requires a very kind and patient man to take care of stock in order to get the greatest returns from the feed. As to keeping stock of all kinds warm and comfortable, there is so much written on the subject that I need not say much. There are some farmers who will build a barn and take a great deal of pains to have it warm as it can possibly be made all over the outside, and leave it open in front of their tie-up clear to the roof. The animal heat goes immediately into the roof of the barn and the cold air falls and keeps the cattle cold, when if they would ceil up in front of the cattle with matched boards the cattle will keep themselves warm and comfortable.

I propose now to make a few figures and show how much stock can be kept on five acres, and how much profit derived from the same. One acre in corn, one hundred bushels; one acre in mixed grain, forty bushels. This will provender three cows liberally from the first of November until the first of June. Three acres in grass will cut five tons, and this will give them sixteen pounds a day for two hundred days. Three fairly good cows on the feed I have allowed them will make 250 pounds of butter each per year, which we will reckon at the lowest price, 20 cents per pound, making a total of $150. The pork that can be made from these cows will at least be 300 pounds at 5 cents per pound, total $15. The two amounts making $165, or $33 per acre. Now the dressing from three cows tied up every night and supplied with plenty of absorbents, and from one hog, will dress one acre each year sufficient to yield a good crop for five years.

These figures, remember, are the minimum. Now let us see what the maximum would be. I never calculated to keep a cow that would not make a pound of butter per day for the year, but we will throw off the 65 pounds and call it 300 pounds. I know lots of men in our county who are getting 30 cents per pound by the year, which figures up $90. Such a cow will certainly produce $10 worth of pork, which makes you an even $100, or $60 per acre for the use of your land. Now you have on a farm of 50 acres tillage land, with sufficient pasture to go with it, in one case $1,650, and in the other $3000 gross income. Now, I ask, is this not as good showing as any trade or profession can make?

KENNEBEC COUNTY.

Institute at Albion.

An Institute for Kennebec County was held at Grange Hall, Albion, February 4th. The day was extremely cold, yet the attendance was good. Papers were read by the Secretary of the Board; the local member, J. E. Brainerd; D. B. Johnson, Waldo; J. M. Deering, York, and by Hon. R. W. Ellis, Belfast. Informal discussions followed the reading of the papers.

HOW TO INCREASE THE FERTILITY OF OUR FARMS.

By J. E. Brainerd, Member from Kennebec.

As the prosperity of not only individuals, but nations as well, depend in a great measure upon the productions of the soil, it is an important matter to know how to increase those productions to such an extent as to satisfy the wants of the tiller of the soil.

This can in some measure be accomplished by increasing the fertility of our farms. In fact an increase of the fertility thereof, accompanied with other requirements, is absolutely necessary in order to increase their productions.

How to increase the fertility of our farms is the topic to which I would invite your attention for a short time.

The subject is one that has been talked up and written upon as much perhaps as any other subject in which the farmer is interested.

Although there is nothing new under the sun, yet upon this matter there may be much more said and written, for we, as farmers, need line upon line and precept upon precept in order to keep us in the way of duty. So we may use all of the resources placed within our reach to keep our lands in a condition that our success as tillers of the soil may not at any time be in doubt, but always be assured.

When we look back through the ages that have passed since the creation of man, and realize in some degree, for we cannot fully comprehend it, the myriads of human beings and the countless numbers of animals and living things that have fed and grown upon the products of the soil, we might reasonably conclude that the producing elements must necessarily be exhausted.

But this is not so. The God of Nature has placed in it inexhaustible resources, which, used in compliance with the laws now well understood, will last to the end of time. When we see a country or a section of one, once fertile and productive, become sterile and barren we may know that the inhabitants at some time carried on a devastating process, and the result is sterility and barrenness.

The Delta of the Nile has long been renowned for its productiveness. The builders of the pyramids thousands of years ago, as well as the innumerable numbers since their time, have been fed from the products of that soil, and still it is capable of sustaining a dense population, and probably will be down to the latest ages. The Flowery Kingdom is another illustration of the resources and the capabilities of the soil. A very large population has been supported for centuries, and still it is not exhausted, but will feed its increasing millions for centuries to come. I will not enlarge on the capabilities of the soil of other parts of the world, but will endeavor to show how we may increase the fertility of ours. The barn and the stable are the great resources from which we must draw in order to accomplish this desirable end. The voidings of our domestic animals contain in a greater or less degree all of the necessary elements which are required to grow the varied crops which our farms produce. This being the case, how important it is that we, as farmers, should put forth our best efforts, not only to increase the quantity, but to have it incorporated with the soil in its full strength.

So important a factor in farm operations were the droppings of domestic animals considered, that a score or more years ago, when cattle were yarded instead of being housed, a distinguished agriculturist said that "the barn-yard afforded a panacea for all of the farmer's ills." If the tillers of the soil could only have enough of barn and stable manure they could laugh at the venders of commercial fertilizers, knowing that with the blessing of heaven their crops would grow, thrive and come to maturity without any of their nostrums.

A good arrangement for saving what comes from our animals, both solid and liquid, is to have a basement or cellar under our tie-ups and stables into which, through scuttles in the floors, it can be easily removed, there to remain covered from the weather, until it is wanted for the purpose of applying to the land. A cement bottom to the cellar is not a bad arrangement, but this can be dispensed with by using absorbents enough to take up all of the liquids. The surface of our State being made up of hills and valleys, a very small part of it being level, there is not much difficulty in finding a location for our barns and stables so that the cellars can be made easily accessible. Another reason why such an arrangement is advisable is that there will be much more room under the same roofing. A roof is quite an expensive thing to keep in repair.

Under the stable hogs should be kept, for they will not only increase the quantity of manure but will very much improve the quality by working it over. Let them do the working over, and if they are not lively enough about it throw a few handfuls of shelled corn on to the heap. That will encourage the business very much unless they are fed too high at the trough.

Tie up the cattle that come to the barn in summer, and the more of them that come the better. In this way you can save quite a lot of valuable manure which otherwise would be of little account. If you cannot have a receptacle for all of the voidings of the stock, under the barn, take up a plank behind where the cattle stand, put under the floor any substance which will readily absorb the liquids, and let it remain until perfectly saturated, and you will have a fertilizing material which will be worth more, pound for pound, than some of the commercial fertilizers that are put upon the market. Or there can be enough absorbents put behind the cattle to take up all of the liquid, which thrown in with the solids, will add very materially to the manure heap.

The time has come when a farmer who has any desire to increase the fertility of his acres, or even to retain them where they are, will not throw the droppings of his stock out beside the barn to be leached by the elements until he wants it to apply to his land, thereby losing much of the value, and of course when incorporated with the soil it will not show so good results as it otherwise would.

If a farmer is obliged, on account of location, to throw the droppings of his stock out of doors, let him at once build a shed over it to protect it from the weather. This will cost but little and the money so expended will pay better interest than if invested in government securities.

In passing around among the farmers of this State, it will be found that quite a portion of them have their manure protected in some way from the weather. This is quite different from what it was a score of years ago. It is a movement in the right direction. Let the work go on, and the time will soon come when every farmer will realize the beneficial effects of housed manure.

We think that we can see some light ahead for the farmer to increase the fertility of his lands through the results coming from an increase of the dairy business. Perhaps we may be mistaken, but the signs appear to point in that direction.

Our State is well adapted to grazing and to the growth of hay for winter use, and it is not far behind many of our sister States in raising corn and the various kinds of grains which go to make the feed for stock.

If there is a butter or cheese factory to which the cream or milk can go, cows enough can be kept to consume all of the hay and grain upon the farm. The products of the cows in the shape of butter and cheese will yield a good profit, while by so doing we shall retain the greater part of the fertilizing elements of our hay and grain upon our lands.

Private dairying can accomplish the same result, provided there is help enough to carry it on. There are reasons, which need not be stated here, that associated dairying will take the lead.

I am aware that there are many articles put upon the market as a substitute for butter, which has a tendency to keep the price of a good article at a low figure, yet, notwithstanding the immense amount of spurious stuff sold and used, a first-rate article always has and always will bring remunerative prices.

A few of the ways in which the fertilizing materials may be increased upon our farms have been mentioned, but to a thoughtful farmer many other ways will be suggested by which much can be accomplished in the same direction. The right application of manure is very important in order to insure the greatest amount of fertility to the soil. There are many ways in applying dressing, and doubtless should be, in order to answer all of the requirements, such as condition of soil, location, and the crop to be produced. A rule cannot be given which will be applicable in all cases. Every farmer should understand the conditions as far as possible under which the application is going to be made, and then adapt his method to it.

There are some soils which are wet and not easily worked where top dressing will pay well. If manure from the barn or stable is to be used in this way, apply it as near the time of snow falling in the fall as possible. Land that can be plowed and worked without much difficulty had better have the dressing incorporated with the soil instead of spreading upon the surface without the use of the plow.

If you do not wish to work hoed crops upon the land, pulverize thoroughly and seed down with a grain crop. On some lands, especially clay loams, it has been found to answer a good purpose to plow in the month of August, inverting the sod so as to have it as smooth as possible, spreading the dressing and working it well into the soil, and then sow to grass alone. The greater the quantity of manure put upon the land and the deeper it is worked into the soil, the greater length of time will it produce a good crop.

Whenever you remove your dressing from the cellar incorporate it at once with the soil so it may have its full strength, and nature will fit it for plant food. If it should be necessary to remove manure from the cellar when it cannot be used, some plaster put upon the heap will help retain its goodness until wanted.

Pulverization of the soil is another means to increase the fertility of our cultivated lands. The late Dr. Holmes, than whom we had no better authority, once said that he would like to have the soil in which the seed was to be placed pressed through a seive so that the particles would be so fine that the little rootlets from the plant could push out without any hindrance. If any one has any doubt in this matter let him take two plats of ground side by side, in the same condition, and put on each the same amount of dressing. Plant one in a slipshod manner, the other thoroughly pulverize and stir the top of the ground frequently until the growing crop covers the ground, and the result will convince the most skeptical.

The use of commercial fertilizers has become so general in our State and they are used in so large quantities it would reasonably be supposed that the increase of fertility would soon be apparent. We are led, however, to believe that it is not commensurate with the amount of money that has been expended for it. I would not discourage any one from buying fertilizers when it is necessary, for, when they are genuine, they pay well for certain crops. I would urge every farmer to make and save all of the fertilizing materials about his premises that he can, and then if need be, supplement it with the commercial manures.

In traveling in various parts of the State, I have noticed that the wash of the highways is not utilized so generally as it should be. Instead of being turned onto land where it will be beneficial, it is left to take its course into the swamp or brook where it is of no particular benefit to any one. I am aware that it may be said that such work is of little consequence. It is the littles when put together that make the large amounts.

I know of a piece of grass land containing one-half acre, more or less, which has had no fertilizer except what has come from the wash of the highway, that has been mowed for more than half a century, and still produces yearly at the rate of two tons or more of hay to the acre. Be sure to utilize all of the wash, from whatever source it may come, without infringing upon the rights of your neighbor.

In years gone by there was a tiller of the soil, so the story goes, who was about done with terrestrial things, but being desirous that his children should prosper, called his sons to him, gave them the paternal acres, telling them that there was a pot of gold buried deep beneath the soil, and that if they would dig perseveringly, they would obtain it.

After their father's decease they went to work digging over the soil, throwing up the subsoil for the heat and the cold, the sunshine and showers to work upon and render productive. They continued to put in honest labor until the acres were all gone over. No pot of gold appeared, but the land so increased in productiveness that it proved to be to them a mine of gold.

There is doubtless much fertility in the various strata of the soil, to quite a depth, when brought up so it can have the sunshine, which in time will fit it for plant food.

I know of a place where in digging for a cellar the dirt was scraped in front for the purpose of forming an embankment. It was graded up, levelled off and seeded down to grass, without any dressing, and it grew so that it was necessary to mow it twice in a season.

There were also two cherry trees set out upon the terrace. These grew finely and bore bountiful crops of cherries. One of them is still standing with a trunk nearly a foot and a half in diameter. The other was broken down by the wind several years ago.

In another case a man in digging a cellar scraped out the bottom and left the dirt around an apple tree, about two feet deep. The tree produced bountiful crops of apples for a long time.

Now, brother tillers of the soil, you have our consent to dig up your acres to as great a depth as you see fit, and stir up the subsoil so that the elements can take it in hand and prepare it for producing various kinds of crops. We would ask you to keep debt and credit with the land thus treated, so you can give the rest of mankind the benefit of your experience.

There has been much said and written concerning the utility of using muck as a fertilizer. Not many years past an analysis of a substance called muck appeared in the Scientific American, which showed no trace of any fertilizing elements. I know not what the object was to be attained by publishing that analysis, for it was not believed by those who had used muck to any extent. The Farm and Home had the right of the matter when it said that "when facts and science do not agree, science would have to step aside." It would be supposed that decayed vegetable matter and the wastings of the highlands that have been collecting in the swamps and low places between the hills for centuries would contain some fertilizing element. Be that as it may, muck when dried is one of the best absorbents we have, and for this purpose it is of much value. It should be thrown out of its bed and exposed to the elements for six months or a year before it is used. It should be dried in the sun and what is not wanted for immediate use should be put under cover until needed for absorbing purposes. It should be freely used in the tie-ups, stables, hog pens and out-buildings, so as to take up the liquids and retain them to be incorporated with the soil.

Any farmer who has muck on his land, or can procure it with but little expense, can greatly enlarge his manure heap and thereby increase the fertility of his farm.

In conversation with one of the progressive farmers of Winthrop who has used muck for more than a score of years, and who has in that time more than doubled the productions of his farm, he said that he could produce better crops where muck had been mixed with the manure, equal to one-third of the bulk, than he could with the same quantity of clear manure.

Muck can be used to good advantage on stiff clay soils. It will break the clay so that the little rootlets of the plants can grow more readily among its particles. I have been testing the effect of clear muck on a half acre of grass land which has a clayey soil. There has been for two years past, directly after haying, two cords of muck spread upon it which has been exposed to the air for at least six months. This has proved quite satisfactory, having increased the crop one-third or more. Muck has been used quite freely for many years on the place where I live and is considered almost indispensable as one of the means of keeping up its fertility. If the same amount of physical strength which has been expended by the sons of Maine in exhuming the precious metals from their bed had been used in taking a portion of the muck which can be found in numerous places in the State, properly preparing and judiciously applying it to our hill-sides and valleys, the world would be better off than it is now.

Thus much has been said, because we belive that as an absorbent it is of much value and that it will pay well for any one to use liberally who can easily procure it, notwithstanding what some writers upon agriculture my say in regard to it.

There have been many ways devised to increase the fertility of our farms, some of which have been and still are very beneficial, but what I wish to recommend and emphasize above all, is that every one who has anything to do with the cultivation of the soil should save and utilize all of the material about his premises that will increase his stock of fertilizers.

Perhaps you may say that this all means work. It is verily so. Ever since the edict from the Almighty went forth that "in the sweat of thy face thou shalt eat bread," work has been a very important fact in producing the various crops that grow upon the soil. Dr. Franklin recognized this fact, when he penned the couplet,

> "He who by the plow would thrive,
> Himself must either hold or drive."

It is impossible to accomplish anything on the farm without work, and the same holds true in the various vocations of life. In order to secure great results constant and unremitting toil is required.

What more health-giving employment than that of tilling the soil! Although the north wind sometimes blows about our ears in rather an unpleasant manner, yet who of the farmers of Kennebec County would wish to exchange places with the inhabitants of India, Central Africa or of that large portion of South America, watered by the Amazon and its tributaries, where vegetation grows luxuriantly, and man has but little to do in order to sustain life?

In those sections the human race is but little elevated above the beasts that roam over their plains and through their jungles. Let us, then, be content with our location and use all of the knowledge that we have and can acquire in utilizing all of the materials that may be placed within our reach and applying the same to our lands so as not to conflict with the laws of nature. By so doing Maine would soon become, so far as the products which can be successfully grown upon her soil could contribute to it, fully abreast of any State in the Union.

Institute at Readfield.

Under the auspices of the Old Kennebec County Agricultural Society, a second Institute for the county was held at Readfield, the headquarters of the Society. Everything was done by the members of the society in charge to have this a model Institute. Entertainment was provided for all present, good music enlivened the exercises, and the good cheer everywhere prevailing gave assurance of a warm welcome. In the forenoon Hon. Rufus Prince, President of the State Agricultural Society, gave a familiar talk on "Lessons from Experience in Fruit Culture." The afternoon was devoted to a discussion of the subject, "Creamery Butter-Making," led by the Secretary of the Board. In connection there was an exhibition of samples of winter butter, both creamery and dairy make, which was an object lesson of interest in connection with the subject under consideration.

PROGRESS IN AGRICULTURE.

By Hon. Edward Wiggin.

It is not my purpose in this paper to trace in detail the progress made in the science of agriculture, and to give the exact date of each new invention and of every improved method, but more particularly to show something of the progress which has been made in elevating agriculture as a calling to the dignity which is its rightful due. I wish also to speak somewhat of the conditions under which alone true progress can be made, and to inquire by what helps, and against what hindrances the tillers of the soil have been able to advance from the condition of mere serfs under the old feudal system, to that proud and independent position which they occupy to-day in this free land.

Whether the story that the original man was presented with a well-stocked farm all finished and fenced, upon which all fruits and vegetables grew spontaneously, without requiring any labor or skill on the part of the proprietor, be a true story, or only an oriental allegory, is not within our present province to discuss. It is germane to our subject, however, to remark that if the story be an actual fact, it was a great blessing to the race of which this original man was the progenitor that he was *snaked out* of this Eden of his and set to work. A state of continual idleness with no incentive to labor or exertion of any sort may be a lazy man's paradise, but it certainly is not a condition in which a man can make much advancement in culture and civilization, or grow to any extent in mental strength and true manliness. By labor we may in time wear out, but it is to some purpose if the world be better for our toil. Idleness means rust which eats away the powers of life with no beneficial results to anybody.

That agriculture was the original occupation of man would seem to need neither argument nor historical research to prove. That it is to-day the basis of all industries, and the solid bed rock upon which all other occupations rest seems equally evident and apparent. When man first began to till the soil, that is, to coax it to do more than it was disposed to do naturally, we have no present means of knowing; but as far back as we have anything like authentic history, either sacred or profane, we find it the chief occupation among nations who made any pretentions to civilization or development.

We of the 19th century are wont at times to swell up in the pride of our superior knowledge and advancement, not only in the science and art of agriculture but in all the other arts and sciences which make for the comfort and convenience of man and bend to his material benefit and social refinement and culture. But when we come to burrow round a little in the old archives, and see what those old fellows were doing, and how they were doing it thousands of years ago, we begin to rub our eyes a little, and wonder if indeed agriculture be not one of the "lost arts," like some other branches of human knowledge the evidences of whose ancient surpassing excellence is at times brought to light by the excavating of the site of some buried city, or the digging around among the rubbish of old ruins.

The luscious canned fruits which give us the sweetest delicacies of summer and autumn during every month in the year were supposed to be the result of modern invention, and we were wont to smack our lips and wonder how our ancient brethren ever managed to exist without these luxuries; but lo! upon the pantry shelves of the frugal housewife of buried Pompeii are found these very cans fresh, sweet and well preserved after having lain buried more than 1800 years since that terrible day when old Vesuvius belched forth that fatal shower of ashes. Our expert poultry-raiser fills the drawers of his patent incubator with stores of fertile eggs, and congratulates himself upon enjoying the fruits of modern invention and of Yankee ingenuity. And as in due time he takes out the fluffy little chicks by the hundred, and sees them hop and chirp and eat as naturally as those produced in the good old way, he strokes his chin with a self-satisfied air, and pities the old-time breeder who knew nothing of these new notions. Yet Diodorus, the ancient historian, who lived in the time of Julius Cæsar, and who in early life travelled extensively throughout Asia, Africa and Europe, and closely observed the manners and customs of the people of the different countries, tells us that "the Egyptians had found out a way by an artificial fecundity to hatch eggs without the sitting of the hen." His account is verified by other writers who inform us that "the Egyptians stow eggs in ovens, which are heated to such a temperature and with such just proportion to the natural warmth of the hen that the chickens produced from these means are as strong as those which are hatched in the natural way." Another old writer says, "It is very entertaining to observe the hatching of these chickens, some of which show at first nothing but their heads, others but half their bodies, and others, again, come quite out of the egg: these last, the moment they are hatched, make their way over the unhatched eggs and form a diverting spectacle." The elder Pliny also, who lived and wrote in the first century of the Christian era, makes mention of this same device. Were it not well then in view of these and kindred facts for us to be a little more modest in our pretentions to originality, lest we find that our newest and brightest notions are but the duplicates of the ideas of some swarthy old Egyptian who had been a well-preserved mummy for thousands of years before we were born?

As it has become somewhat common for writers and speakers of no mean pretentions upon agricultural subjects to dilate upon the woful ignorance of the ancients in regard to the science of agriculture, and the rules and appliances for carrying it on successfully, let us for a few moments examine a little into what some of the old writers upon this subject have to say upon the matter, and see if the real, fundamental rules which underlie the intelligent and successful tilling of the soil, were not quite as well understood by those old fellows who had some favorite god or goddess to appeal to at every turn, as by some of us, who have our own pet superstitions, in what we complacently term this enlightened age of the world. One of the earliest writers on farm topics whose works have come down to us is the old Greek poet Hesiod. His father struggled up from poverty to the possession of a considerable estate, which, upon his death, he left to Hesiod and his younger brother Perses. The division of the property having been left to arbitration, the younger brother, by means of bribing the judges, obtained the bulk of the estate, whereupon the poet emigrated to another section of the country and struck out for himself. He seems to have been a practical farmer in humble circumstances, and his poems upon matters relating to the farm we may surmise were written upon wet days and at odd hours snatched from rustic toil. In his principal poem, entitled "Works and Days," he gives us some sound agricultural and philosophical maxims, and in the way of advice to his brother Perses, utters many wholesome truths which would not be out of place in any age. He counsels him (who knows but he was an honest old granger?) by all means to keep clear of litigation and to devote himself to honest labor on his farm as the true source of permanent prosperity. He does not devote his poetic gift to describing the romantic charms of rural life, but gets right down to business and gives good common-sense rules for a farmer's guidance. He gives his younger brother (whose rascality if he ever suspected he seems to have forgiven) sound advice about the observation of the weather, cautions him not to plow his land when too wet, tells him the best kind of timber of which to make a plow beam, also how to construct a convenient farm-house, and that it is better to cut wood after the leaves have fallen. He tells him to take good care of his farming tools and warns him against the practice of lending his plows, etc., to shiftless neighbors. Farther on he counsels him as to the proper time of life for him to marry, and gives him sound advice about the kind of woman who will make a comfortable helpmeet for a working farmer, and closes this part of his subject by reverently impressing upon him that the immortal Gods rule in the affairs of men, and that after obedience to the Gods, his next duty is in all his intercourse with his fellow-men to keep his tongue from idle and provoking words and to preserve a strict purity in all the commonest occurrences of every-day life. Not bad maxims these, both agricultural and moral, and could the old heathen poet step over the few thousand years which divide his time from ours he might work in very handily as a lecturer before one of our Farmers' Institutes of to-day.

Passing over Homer, whose writings upon agricultural matters partake almost wholly of the poetical instead of the practical, we come to Xenophon, who lived some 400 years before the Christian era. A disciple of Socrates in his youth, he afterwards became a noted general, and followed Cyrus the Great in his Asiatic campaigns. After the unfortunate battle in which the great Cyrus was defeated and slain, Xenophon showed his rare skill as a military leader by successfully conducting his countrymen on that masterly retreat of eight months through an enemy's country. Later in life he was exiled by his ungrateful countrymen and retired upon a farm where he devoted himself to agricultural and literary pursuits, and would, no doubt, have made a first-class agricultural editor if newspapers had been known in those days. In fact many of his rules and maxims would be good practical common-sense reading if copied into the papers of to-day. In his great work on agriculture he informs us, and the sentence is as true to-day as when he first uttered it, that "The science of husbandry is extremely profitable to those who understand it, but it brings the greatest trouble and misery upon those farmers who undertake it without knowledge." He then goes on to give directions in detail for all kinds of farm labor. He recommends frequent plowing and also the fallowing or summer tilling of worn lands. Moist fields, he tells us, should be back furrowed in narrow lands for the purpose of better drainage. He emphasizes the necessity of saving everything in the shape of manure in order to prevent the exhaustion of the soil. He advises a young farmer, in purchasing a farm, to look out for one naturally good, on which there are small improvements, rather than to buy one already improved to its highest capacity. By so doing, he can obtain a farm with much less outlay of ready money, and can, by judicious management and faithful industry, obtain all the benefits of improvement himself. The lapse of more than two thousand years has not proved the old soldier-farmer of ancient Greece to be very far wrong in the most of his agricultural teachings. Leaving now the old Greek writers, of whom there were still a number who wrote sensibly upon matters relating to husbandry, let us cross over and see what we can find upon the subject among the Romans of the elder day. The earliest Roman writer of any note upon agricultural topics was Cato, the great Roman censor, who was born of poor but honest parents at Tusculum, in the year 232, B. C. Brought up on a farm and trained to habits of industry, frugality and economy, he was, at the age of seventeen, left by the death of his father, in possession of the paternal acres. About this time the dreaded Hannibal invaded Italy, and the young farmer left his plow in the furrow and went to fight in defence of his country. After five years of military service the war was ended, and Cato returned to his farm and entered with renewed ardor into the work of its cultivation. In his work "On Agriculture" he has left us the results of his study and experience in matters relating to husbandry, and it is surprising to find how much of it fits in and commends itself as good orthodox agricultural doctrine for the present day. With all the advances that twenty centuries have made in modes and appliances for tilling the soil, with all that science has been able to do for us farmers, have we really got so very far ahead of old Cato, who tells us that the very foundation of success in raising crops consists in plowing the ground well and often, manuring plentifully, sowing good seed and a plenty of it, and then keeping the ground thoroughly clean from all weeds while the crop is growing. Though we have better appliances and more labor-saving machines than did this old Roman, and though one man and team with our present farm machinery can probably care for a dozen times as many acres as he could on his old-time sabine farm, yet let any Maine farmer of to-day start in with his corn or potato crop next spring and cultivate it according to these rules, and given the early and latter rain, and the absence of frost and rust, I would be willing to warrant him a bountiful crop. We may have different and better ways of doing it than Cato had, but the thing to be done is still just exactly what he said it was. He then goes more into details and recommends the thorough and frequent use of the harrow, gives directions for soaking or steeping seed before planting, and tells us to be sure and keep all surface water from standing on land where crops are growing, and emphasizes the necessity of thorough drainage. He also recommends the plowing in of green crops as a method of fertilizing the soil. Aside from his recommendation of frequent sacrifices to the Gods to secure their favor (which indeed is matched by some of the whims and superstitions of farmers of this age), his book would not be a bad guide for a young farmer of to-day. I have often thought I should like to resurrect the old heathen and put him on a good Aroostook farm and see what he would do with it. Perhaps after he got the hang of the tools he wouldn't be so far behind the rest of us after all.

Now, skipping along we come to Virgil, who lost his farm when Cæsar Augustus parcelled out the Roman lands to his veteran soldiers, but regained it through the intercession of an influential friend. What a wealth of agricultural lore expressed in beautiful verse we have in the Georgics of Virgil. Not all of it practical to be sure, for that could hardly be expected of a poet; having much of the mythological and superstitious interwoven in it, it is true, but that was but the religion of the day; still it shows its author to have been well versed in the agricultural theories and practices of his time, and a keen observer of the processes of nature. He tells us at the start that it is the decree of Jove that man must work if he would eat, and that the husbandman need not expect a plentiful harvest without faithful, industrious toil. True, he tells us in the next line that Jove invented the plow, but why he didn't make a steel one and done with it instead of the clumsy wooden concerns used for so many centuries he does not inform us. In his introductory verses he treats of the different kinds of soils and tells what treatment each should receive, touches upon rotation of crops, upon drainage and the fallowing of barren lands which seems to have been a favorite treatment among good farmers in the olden time. He gives minute directions for making a plow and for covering the share with iron, tells how to make a good threshing floor, advises to cull each year the largest, fullest and earliest grain for seed, tells what kind of soil is best adapted for each different crop, and gives much general information and good sound advice. The second Georgic is devoted to the culture of trees and vines, and shows that the poet has studied his subject carefully. The third poem treats of the breeding of horses, cattle, sheep, &c., and of the necessity of keeping up the excellence of the herd by carefully weeding out the scrubs and replacing them with better bred animals. Upon the horse question our poet was an enthusiast and had a keen eye for the points of a good animal. Here is his idea of a stallion, whether for the stud or for the warrior's use.

> The colt that for a stallion is designed
> By sure presages shows his gen'rous kind;
> Of able body, sound of limb and wind,
> Upright he walks, on pasterns firm and straight,
> His motions easy; prancing in his gait;
> The first to lead the way to tempt the flood,
> To pass the bridge unknown, nor fear the trembling wood;
> Dauntless at empty noises; lofty neck'd,
> Sharp-headed, barrel-bellied, broadly back'd,
> Brawny his chest and deep; his color gray;
> For beauty dappled, or the brightest bay;
> Faint white and dun will scarce the rearing pay.
> The fiery courser, when he hears from far
> The sprightly trumpets, and the shouts of war,
> Pricks up his ears; and, trembling with delight,
> Shifts place, and paws, and hopes the promis'd fight.
> On his right shoulder his thick mane reclin'd
> Ruffles at speed, and dances in the wind.
> His horny hoofs are jetty black and round,
> His chine is double; starting with a bound
> He turns the turf and shakes the solid ground,
> Fire from his eyes, clouds from his nostrils flow,
> He bears his rider headlong on the foe.

The poet then goes on to give very minute instructions as to the care of breeding animals and the rearing of the young; for the selection of different types of animals for different purposes, and enjoins keeping a careful record of the pedigree of each animal, both male and female, as an indispensable guide in breeding. He soundly recommends the training of steer calves when young so that when they are old enough to plow they will be handy and ready for work. Colts, he tells us, should be kindly taught from a tender age and not left to run wild until they have matured in size and strength and then be broken with a rough hand. Indeed so sound and sensible are most of his instructions that were they divested of their poetical garb, and their frequent allusion to mythological divinities we might easily imagine we were reading the columns of some first-class agricultural journal of to-day; and, though we may laugh at some of the notions to which he holds so tenaciously, yet may not some practical farmer of the good year 2100 or 2200 read with a smile that it was the practice in our time to make sweet clover into sour mash before feeding it to our cattle? His final poem is devoted wholly to the care and culture of bees, and in it he shows a thorough knowledge of the habits and wonderful intelligence of this most interesting animal, and in fact his theories and methods of treatment differ not more from some of our best bee farmers of to-day than they differ from each other.

But we are admonished that we must leave these old writers of the time past, though we love to linger over their pages, and note the interest, the enthusiasm and the tender love which many of them had for rural life and for agricultural pursuits. We have dwelt upon them at such length for the purpose of showing that away back in the far ages of antiquity, agriculture was acknowledged as a leading and most important pursuit, and that men eminent in every walk of life, poets, scholars, soldiers and statesmen, scrupled not to engage in its pursuit and to give to it the best of their thought, study and attention.

We wished also to show that many of the fundamental rules which underlie successful agriculture were known to the best farmers of the far-away past, and that many of them, like the rules of mathematics and of morals, cannot change with the passing years, however much the methods of applying them may be diversified and improved upon. But as in the reading of history we are often apt to let the gorgeous purple and golden crowns of royalty, the pomp and glitter and lavish plenty which surrounds courts and princes, and the military glory of great and renowned chieftains blind our eyes to the misery of the common people, so, in reading these old writers upon farm topics, if we are not careful we may imagine all the tillers of the soil of those old days to have been happy, prosperous and manly farmers. It is only when the curtain is lifted a little and we get a glimpse of the true condition of the average peasant of antiquity that we can measure the vast strides made by human progress in this free land, and the immense superiority of the average American farmer of to-day in social condition and intellectual growth over his old-time brother. Though all that science and the progress of knowledge and experience has done for us has not eliminated from the farmer's occupation the necessity of honest toil and frugal industry, which are to-day the conditions of success as they were centuries ago, yet the American farmer has learned to make his labor *tell* far more in everything which relates to comfort and to true progress in manliness and mental development. And after all, perhaps our "progress" consists not so much in the knowledge of the thing to be done as in the manner of doing it, and the tools to do it with, and also in the advancement and development of the man and woman who has it to do, both intellectually, socially and morally. As we undertake to trace down through the centuries the progress in agricultural knowledge, methods and appliances, skipping along from one landmark to another, the authorities are so numerous and their works so voluminous that it is difficult to decide what to touch upon and what to pass over. We mention as a matter of interest the following description of butter making, which is the earliest we could find. It is taken from a work on agriculture written by an old German writer in the 16th century, and translated into English by a courtier of Queen Elizabeth. The spelling and some of the words look strange and quaint to us now, but we can easily get the meaning of the writer.

"Of milke, is made Butter, whose use (though chiefely at this day among the Flemings) is yet a good & profitable foode in other countries, and much used of our old Fathers, yea, even of the very Patriarches (as the Scriptures witnesseth). The commoditie thereof besides many other, is the asswaging of hunger & the preserving of strength: it is made in this sorte. The Milke, as soone as it is milked, is put out of the Paile into Bowles or Pannes, the best are earthen Pannes, & those rather broad than deepe: this done, the second or the third day, the creame that swimmes aloft is fleeted off, & put into a vessel rather deepe than big, round & cilinder fashion, although in other places they have other kind of Charmes, low and flat, wherein with often beating & moving up & downe they so shake the milke, as they sever the thinnest part off from the thicke, which at the first gathers together in little crombles, & after with the continuance of the violent moving commeth to a whole wedge or cake: thus it is taken out & either eaten fresh, or barrelled with salt."

Here, again, we see that these old fellows understood the *principle* of butter making. They knew the thing to be done, but what wonderful improvements have been made in the methods of doing it and in the implements and appliances for effecting the work.

In attempting to trace the progress made in agriculture in England from the earliest times, we find it so interwoven with the progress and elevation of the race, that is to say of the common people, that the history of the one is but the story of the other. Under the old saxon rule, agriculture was of the crudest sort. The mass of the common people were ignorant and in a semi-savage state, just emerging into the first glimmer of a better civilization. Serfdom was an institution of the country, and a farmer working with a master's collar about his neck is not likely to make much progress or improvement in his calling until he can burst the odious fetters and strike out for himself.

The Norman Conquest brought little amelioration of the condition of the English farmer, if indeed he could then be dignified by that name. The lands were parcelled out by the Conquerer among the great lords, and the common people or villeins as they were called, were mere dependents upon these lords, to whom they were obliged to swear fealty for their holdings. The manor house was the centre of every estate, and all the labor upon the home farm of the great lord was done by these villeins as a part of the service due their master. But the innate longing for freedom and the desire of man not only to own himself but to be master of the fruits of his own toil, and to tread upon a portion of God's green earth which he might call his own, early made itself manifest in the Anglo-Saxon race, and the long struggle began. It was the fight of the many against the few; but the few were rich, powerful and organized for mutual protection, while the many were sunk in poverty and dependent for the means of subsistence upon the will of their self-constituted lords and masters. Still with each century some little progress was made, slow, to be sure, for many weary years, but still a gain. It is interesting here to note, as we study carefully the history of these times, that the continual wars which the old English kings were perpetually waging against their neighbors were really the means of the advancement of the rights and liberties of the people, for it took money to carry on war, and whenever the funds got low and the King was forced to ask of his faithful Commons a fresh grant, they were not slow to seize upon the opportunity to make the compliance with his demand contingent upon the granting by the crown of some extension of their liberties. Thus they early learned the trick of tacking on to the end of an appropriation bill some needed reform which the King must accept in order to get his cash. Said Queen Elizabeth to the Spanish Ambassador when her Parliament in 1566 began to demand increased privileges, "I cannot tell what these devils want."

"They want liberty, madam," replied the Spaniard, "and if princes do not look to themselves and work together to put such people down they will find before long what all this is coming to."

But for many long years the condition of the agricultural classes in England, of the men and women who did the real work upon the farms, was a most deplorably hard one, and their lot was one of almost unremitted toil with very little opportunity for anything like social or intellectual improvement. It was a principle early established, that the land of England must support the government and protect the nation; and what little the State left the farmer the church took, so that little if anything remained but a bare subsistence.

How is it possible to expect much progress in agriculture, that is to say, much progress toward the elevation of the agricultural classes to that position to which they are properly entitled, under a system of government erected upon the principle that the few should enjoy the benefit of the toil of the many, and where the patent of nobility excluded all who labored with their hands for their daily bread? Still the spirit of manhood was slowly developing as the years passed on, and men and women were gradually being prepared for that new departure which was to be inaugurated upon the shores of the New World. It required all the toil, all the suffering, all the oppression, and all the struggles of the centuries to bring the sons and daughters of toil up to the point where they could fling the whole past behind them, and, crossing the stormy sea, could seek on these western shores, an opportunity to work out the problem under different influences and with different surroundings. Slow but sure had been the onward march, and to note any progress at all it is necessary to compare points separated by long periods of time. But the grand forces were at work which were to undermine the power of kings and of tyrants, and the day of the elevation of the people to freedom and true manhood was beginning to dawn. The results of the evolution of centuries were apparent when the embattled farmers of the New World stood with unwavering front in determined opposition to the tyranny of the Old, and fired the shot which, echoing round the world, proclaimed that here, in this broad and still uncultivated continent, man had thrown off the fetters of the old-time slavery, and had asserted his unrestricted right to be his own master, and to enjoy the benefit of his own toil. Now, indeed, began to be established the conditions under which agriculture and the agricultural classes could make sure and stable progress. As we said before, progress in agriculture and progress in manhood go hand in hand, and only by breathing the free air of a free country can true manhood be successfully developed. And we assert further, that though large populations may subsist upon lands owned by the few and cultivated by the many, still true progress in the highest and fullest sense of the word can only be made where the tiller of the soil is the sole and undisputed owner of the land he tills. Here, then, in free America, with her free air, free land, free schools, free press, free thought, free speech and free ballot, are the true conditions of agricultural progress. Here, in this land of homes, where every farmer is a lord of the manor, under vassalage to no power on earth, owing only that allegience which is due from every good citizen to the government of which he is himself a part, have we a right to expect that this noblest of callings should be most fully and carefully developed, and that those engaged in its prosecution should advance to that high plane of manhood and womanhood which is here open to them. For us has been fought the weary battle of the centuries; it is for us to improve and to extend the fruits of the victory.

That most unparalleled advancement has been made in this country during the last century, not only in the science and art of agriculture but in the condition of the agricultural classes, both socially and intellectually, must be admitted by any one who will give the subject the slightest attention. Perhaps in no respect is this improvement more marked than in the methods of performing the labor of cultivating the soil, brought about by the greatly improved and multiplied implements and machinery now in general use upon the farm. The encouragement offered to inventive genius by the wise and generous laws of our free republic bore rich fruit in the vast number of improved implements and labor-saving machines which were put into the hands of our farmers to aid them in their work. As a type of the progress made in the improvement in farm implements, let us but look at that emblem of the farmer's calling, the plow. From the old wooden plow, with its clumsy iron straps, in common use when our own good State of Maine added her bright star to the blue field of the Union, to the bright steel plow of to-day, with its graceful lines and polished share, is a long step forward in the line of agricultural progress. But even this was not sufficient for the requirements of the age, and to it has been added the sulkey and the gang, and upon the prairies of the West the steam plow, that triumph of inventive genius, which with tireless energy does the work of many men, and renders it possible for that fertile region to become as it were the granary of the world. The steady *swish* of the old scythe through the heavy grass has been replaced by the merry click of the mowing machine, and the reaper has taken the place of the weary sickle. In all the lines of farm labor a like progress is noted, and to enumerate all the improvements in the machinery of the farm would be indeed an endless task. This improvement has resulted in a division of labor, and has removed the necessity for the farmer to produce at home the larger part of the articles needed for his comfort and convenience. The old hatchel and flax break, the cards, the spinning wheel and the cumbrous old loom may still be seen upon some farms, but they are piled away in the lumber-room and only preserved as the relics of a past age. We might also note the progress made within the century as shown by the improvement in flocks and herds, in horses and swine, brought about by the introduction of better breeds and a more careful and intelligent system of breeding and feeding. A visit to one of our State fairs, and a survey of the stock of various kinds there exhibited, will convince the most sceptical that a wonderful improvement has been made in this branch of agriculture.

But after all that science, experience, and inventive genius has done for the farmer in the way of improved implements and better modes of cultivating the soil, the most important question is, "What has the farmer done for himself?" Has he made that progress in true manhood, in social and intellectual culture which the favorable conditions with which he has been surrounded have rendered possible? Has he advanced to that honorable and dignified position in the social and political scale to which the importance of his calling enables him? In examining this part of the subject we are forced to admit that though much has been gained, yet in this respect progress has been the slowest. And, indeed, the reason for this slow advance is patent, and was but the result of the accumulated force of the customs and traditions of ages. The influence of years and centuries, during which the farmer had been considered and had been accustomed to consider himself as degraded in the social scale by his calling, was hard to get over, even in this free land. "Nothing but a farmer" was long a current phrase, and though the American farmer acknowledged vassalage to no lord or master, still it was hard for him to stand erect with his hat on before the man of fine clothes and softer hands engaged in other professions without a slight feeling of inferiority. It is one of the most unmistakable signs of progress that this state of things is fast passing away, and the idea that farming is in any sense a degrading occupation is being stowed away in the lumber-room of the past along with the old clock reel and the wooden plow. Education, not only in the schools, but by means of the press in disseminating agricultural books and papers among the people, has had a vast influence in bringing about this change. Agricultural colleges established in the several States, at which a farmer's son can at small expense receive a sound practical education, have also done much in this direction. (May I say here in parenthesis that it is folly to object to them because all their graduates are not farmers. The glory of the situation is that the farmer's son who has a special genius for some other calling, and who, if forced to stay on the farm would be a round plug in a square hole, may, at an expense within his means, receive an education which will fit him for usefulness in the line of work to which he is specially adapted.) Another indication of progress among farmers, is the increased appreciation of the means and opportunities of advancement, as indicated by the better attendance at Farmers' Institutes and other agricultural meetings where questions of interest to the farmer are discussed, and where the advanced thought of the best and most progressive men of the profession is brought directly before the people, and where new and better methods are suggested which each can experiment upon, and accept or discard according as they may be adapted to his own special line of work or particular locality. The general participation of farmers of the different sections in these discussions, and the intelligent and critical manner in which each new theory is dissected and its merits fully analyzed as to its practical details is an unmistakable mark of progress.

Time was, in the not distant past, when farmers were wont to sit passively and with closed lips and listen to some so-called agricultural address from some speaker, educated it may be in other lines, but knowing little of the true principles of the science of agriculture, and whatever theories were advanced, whether of merit or otherwise, were received with respectful and silent attention, and at the close each farmer went to his home to continue his work in the good old way. To-day, he must be a bold man who would presume to stand before a company of farmers and advance any new theory or system with which he is not himself thoroughly and practically acquainted, and which he is not prepared to have intelligently and critically dissected by questions and discussions from the floor.

Many other encouraging indications of progress and advancement and of the elevation of the social and intellectual condition of the farmers of our country might be mentioned, but they are evident to any one who will give the subject any thought or attention. We have not time here to note them all, but a paper of this kind would certainly be incomplete were we to fail to mention that grand and progressive organization which is at once an indication and a means of progress and which is doing as much if not more for the advancement and elevation of the American farmer to-day than any other agency—the Order of the Patrons of Husbandry. We say it is an indication of progress because at no period of the past was such an organization practical or possible. It was indeed an experiment at the first whose promise was seemingly small, but the times were ripe for its inauguration and from its small beginning it has developed into the strongest and most intelligent labor organization in the whole world. With no special antagonism to any other meritorious calling, seeking with no selfish aim to cripple or destroy any other worthy industry, its purpose is by combined effort and by co-operation in all practical ways to insist upon the right of the tiller of the soil to a fair share of the wealth his toil produces. Recognizing the equality of the sexes and the refining and elevating influence of woman, it admits her to an equal participation in the work and benefits of the order and acknowledges that to her interest and assistance the strength and influence of the organization is largely due. With its subordinate granges located in nearly every school district throughout the land, it affords the means of reaching the farmers of every locality and of enabling them to unite their efforts intelligently for the advancement of every needed reform. Giving due prominence to the social, moral and educational features of the order it relieves the monotony of continued labor upon the farm, inculcates principles of sound morality, fosters a degree of fraternal interest on the part of each in the welfare of the whole, and insists upon liberal provision for the education of the people. By the discussions and deliberations in the subordinate granges and in the higher bodies of which the order is composed, the farmer becomes familiar with the workings of parliamentary bodies; he acquires the habit of speaking in public, of thinking upon his feet, and of expressing his thoughts in a logical and coherent manner. In this way he is also being educated for the performance of the legislative duties which often devolve upon him, in the knowledge of which too many of the representatives of our agricultural districts have in the past been deplorably ignorant. In a word the grange helps the farmer to a better knowledge of his rights and privileges, his duties and responsibilities; it teaches him to assert and maintain the one and to realize and perform the other. It increases his self-respect and his respect for his honorable calling and in every way aids him to be a better farmer, a better neighbor, a better citizen and a better man.

Farmers of Maine, the outlook is truly encouraging. From all points of the horizon come cheering indications of progress and of advancement. We are fast getting out of the old ruts and climbing upon higher ground. We are fast leaving behind us the old servile traditions of the past and are learning to stand erect in the pride and dignity of conscious manhood, and to look the world squarely in the face, scorning longer to ask as a favor what we are entitled to demand as a right. From the condition of the tiller of the soil under the old feudal system to that of the American farmer of to-day is a long stride ahead in the line of human progress.

But, though much has been accomplished, much still remains to be done. Let us remember that with increased privileges and more favorable opportunities come added responsibilities and more exacting duties. While we rejoice in the one let us not fail to be faithful in the performance of the other.

We have endeavored to indicate the conditions necessary to true agricultural progress and to show that those conditions exist at their best only in a free country.

It is, therefore, our first and most important duty, as farmers, to foster and protect with jealous care the free institutions of our republic. No class is more directly interested in the right administration of the government in all its details than those who own the homes and cultivate the soil of the land. For this reason farmers should take a more careful interest in the politics of the country. We do not mean by this that they should seek to become politicians in the common and somewhat unsavory acceptation of the term, but that they should exercise a careful supervision over the matter of nominations to elective offices, to the end that the right men may be put forward as candidates for the suffrages of the people. It is in the primary meetings that they can make their influence felt to the best advantage, and it is in this very point that they have been most remiss in their political duties. It is too often the case that the party ticket is made up in some village office by a small coterie of self-constituted political censors, and the farmers who are often in a large majority in the district, though protesting against many of the names selected, allow the whole matter to go by default by their failure to attend to it in its initiatory stages. We do not mean that farmers should insist that only members of their own calling should be put forward for office, but what we wish to emphasize is the idea that it is the duty of the farmer to make it a point to attend all primary political meetings, and to see to it that good and true men are put to the front, men who will conscientiously guard the liberties and the interests of the whole people, and not, as is too often the case, those who seek political advancement from purely selfish and mercenary motives.

Upon the farmers of America, on account of their numbers and increasing power and influence, largely rests the responsibility for the proper administration of the government. At their door will lie in a great measure the blame if wicked and unprincipled men are allowed to degrade the councils of the nation. Let the farmers of America "see to it that the Republic receives no detriment."

YORK COUNTY.

Institute at Cornish.

By invitation of the Ossipee Valley Agricultural Society through its President, B. F. Pease, the Institute for York County was held at Cornish on February 10. Of the members of the Board there were present Messrs. Deering of York, Pike of Oxford, Moore of Somerset, and also as assistant lecturers Hon. Edward Wiggin of Presque Isle and Mr. H. L. Leland of Sangerville. The members and speakers were the guests of the Society during their stay. There was a large attendance throughout the day and evening. The towns embraced in the limits of this society are all largely interested in rearing stock, hence the subjects selected for discussion related to that interest. In the forenoon a paper was read and a discussion followed on the subject of "Pastures." In the afternoon the subject was "Beef and How to Make It." The Secretary of the Board took up the subdivision "How to Breed the Steer," and Mr. Deering, the local member, "How to Feed Him." In the evening Mr. Wiggin repeated his lecture on "Progress in Agriculture."

PASTURES.

By H. L. LELAND, Sangerville.

The present market value of farm animals and animal products is low. The outlook for the future is that with the easily tilled, fertile lands of the west animals and their products will continue to be put upon the markets at prices so low as to tax all the intelligence and economic effort of Maine farmers to continue stock growing, subject to the sharp competition they must inevitably meet. It is easily demonstrated that sections favored with a mild climate and fertile soil can produce dairy products, beef, mutton and wool at low cost. With low rates of transportation these products can be laid down in eastern markets at low prices. The climate, products and soil of Maine compel stock husbandry as the basis of its agriculture. If the West and South can produce profitably cheap beef, mutton, wool and dairy products, Maine farmers must learn to produce and manufacture dairy products cheaply and grow cheap beef, mutton and wool. However much other sections are superior to Maine in most agricultural resources, in the growth of nutritious grasses Maine is not excelled. Fortunate for us our valleys and hills are clothed with grass. And, moreover, to our advantage, grass as pasturage, and I think also as hay, is the cheapest, as it is the most natural food for our domestic animals. The grass crop in its two forms as pasturage and hay, in value largely exceeds all other crops produced in our State. With each returning spring nature reclothes our fields and pastures, our hills and valleys, roadsides and lawns with grass, green, luxuriant, beautiful. Grass in our State is most truly the perpetual, the sure foundation of our agriculture.

The large value and leading position of the grass crop is fully recognized in the general system of our agriculture. The application of manures and special fertilizers, the rotation of crops, tillage and seeding, are all arranged and carried out with the view of enriching and preparing the soil to yield the largest and most valuable crops of hay. Our inclinations incline towards the discussion of farming in its relations to the hay crop, a fruitful theme, yet one that has been thoroughly and ably presented to public consideration through the agricultural press and by the Board of Agriculture. Mine, therefore, be the task, in the time allotted, to call attention to the pastures of Maine. A majority of farmers well understand the necessity of manures and tillage in field culture, while a majority of the same farmers use few or no means, make little or no effort to improve and enrich their pastures.

It would seem that we have somehow got the habit of expecting our pastures to yield spontaneously all the grass our stock requires be there many or few animals, just as the brooks fed by living springs supply an abundance of water to quench their thirst. We apply the law of compensation in the culture of our fields and neglect to do so in the management of our pastures. The result is what it has ever been, what it always must be. Return in some form to the soil an equivalent for the elements of fertility removed in the crops harvested and productiveness will be maintained; neglect to return these elements of plant food and we have first diminished yields, followed by sterility. Mr. Hall C. Burleigh is reported as publicly stating that New England's superiority as a beef-producing section lays first of all in the quality of our grasses, green and dried. The evidence is too fully proven to be generally questioned that growth in young animals—beef, dairy products, mutton and wool can be made at pasturage at less than one-half the cost of producing a like quality and quantity when obliged to feed from winter's stores.

It might be shown at great length that pasturage is the cheapest source of supplying all our domestic animals with feed during the growing season. There have been carefully conducted experiments made that prove grass fed by the animals at pasture is the cheapest possible food. There are on record the statements of practical farmers who claim larger results in milk, growth, beef and lambs, while the animals are at pasture and at from one-half to one-fourth of the cost of winter feed. We have the authority of S. L. Goodale, former Secretary of the Board of Agriculture, for the statement that in the dairy sections of New York and Vermont the best lands are used for pastures, and not the poorest. "The dairymen in those States reason in this way: 'My profit comes from milk and milk is produced mainly in summer. I must give my cattle the best feed when it will produce the most.' They take the poorer lands for mowing, and they are content with a smaller amount of forage per acre for their winter feed than they are for summer feed." In Maine we reverse this practice, using our poorest lands for pastures. Our pastures are generally either extemely wet lands, lands too broken and full of stones for tillage, or lands situated on high hills and precipitous hill-sides. In addition to these wet and rocky lands which are available only for pasturage or to grow wood, there are in probably all the older counties of the State on many farms, a considerable area of smooth lands which have been tilled and cropped for a long series of years and have at length become so exhausted of fertility as no longer to pay the cost of cultivating and harvesting the light crops they will produce. These lands have been turned into pasturage with the expectation that somehow they will recuperate. Experience, however, with this class of lands demonstrates that renovation through pasturage only is not to be relied upon. If lands are too infertile to grow nutritious grasses some outside help will have to be resorted to to reclaim them. If let alone or given up to stock they soon become mossed over, weeds, brambles and bushes spring up, and they soon become nearly useless as pasturage.

But time need not be taken longer to present a picture of the general condition of Maine pastures. General neglect is enough of language to employ in describing them. To point out the way to their improvement is another thing and a most difficult task to attempt. Our ideal pasture and possible real, is a smooth surface free from noxious weeds, brambles and bushes, a dense turf made up of a great number of varieties of grasses, some springing up early in spring, others growing and continuing green and luxuriant during the extreme heat and drought of summer, and still other varieties continuing to grow till late fall and affording food even till winter spreads her mantle of protection. But the pastures of Maine are not like this and there is a deal of work to be done before we can get such a turf to grow in them as is the most desirable—a turf that will feed abundantly all through the growing season on each acre of surface one cow, and, may we add, one sheep.

In a State so widely extended as ours, with its marked difference in soils, it is apparent that methods in the treatment of land, whether in field or pasture, must essentially differ. Yet there are general principles that will apply to all sections. 1. If the soil is lacking in the elements of fertility they must be restored in some form to insure productiveness. 2. If the soil is saturated with water it must be drained to produce nutritious grasses. 3. If noxious weeds, brambles and bushes have got possession of the ground these must be destroyed and give the grasses a chance to grow.

Pasture lands may be classed and treated under two general divisions. 1. Lands available for tillage purposes. 2. Rocky lands and hill lands unavailable for tillage. Of the first class of lands when used for pasturage practical farmers are not agreed as to the best course to be pursued in their treatment and renovation. Those farmers who advocate and use the plow in renovating pastures claim that noxious weeds and worthless grasses can be more quickly and certainly eradicated by tillage than by cutting or other means when kept permanently in grass. They also claim an improvement in the mechanical condition of the soil and its enrichment by adding new stores of plant food in the decay of vegetable growth turned into the soil and the beneficial effects of tillage in rendering the inert plant food contained in the soil soluble and thus available to promote increased growth. Also when pastures are frequently tilled and re-seeded those varieties of grasses best adapted to close feeding can be selected, thus taking the place of inferior varieties. Yet to plow or not to plow pastures is a question that has been and is still widely discussed. The writer of this paper claims no superior knowledge that will allow him to decide the point either in favor of tillage or the keeping of the pasture in permanent grass. It is, however, quite probable if not a certainty that the best course to pursue in reclaiming pastures differs in different localities on account of difference in soil, and the best practice to pursue in one place would not succeed as well in a locality distant and on a different soil. It is not proposed to discuss at length the advantages of tillage as against the system of permanent pasturage at this time, as it is intended to offer the experiences of practical farmers on these points before closing. In treating, however, of the renovation of pastures this fact must not be lost sight of. If the material out of which plants grow is not in the soil in an available condition, then such food must be added to the soil, or that in the soil in an unavailable form must be rendered available before any marked improvement can be made in reclaiming pastures to increased productiveness.

While there is no doubt that an application of farm-yard manure either as a top dressing or worked into the soil would enrich these pasture lands and cause a good growth of feed, yet farmers generally think they cannot spare manure for this purpose as their fields call for all they can secure. Yet there are special fertilizers, some of which cost but little, and an application of some of these will have a marked effect in increasing the growth of nutritious grasses.

There are a class of soils upon which an application of gypsum will produce very favorable results. Clayey, moist soils are those generally improved by plaster. It would be well for farmers to test the value of plaster and if it is found to act beneficially it will be a cheap means of renovating pasture and grass lands. There is undoubtedly much of our soil upon which plaster will have no appreciable effect. Upon these soils ashes may, yes, almost certainly will prove a valuable dressing. If our supply of barn manures are inadequate to our needs and our pasture lands are allowed to deteriorate for the need of fertilizers, let us not longer allow the wood ashes which is one of the most valuable and essential of fertilizers to be shipped out of the State to enrich the soils of Long Island and New Jersey.

The evidence is pretty conclusive, as shown by the animals that graze our exhausted pastures, that the general want is the basis of bone formation—phosphate. This element seems to be soonest exhausted from lands devoted to pasturage being gathered up and carried off in the bony structure of growing animals and also in the milk from dairy cows. Lands deficient in phosphate of lime of course respond readily to an application of bone dust or of superphosphate. This essential element of plant growth is sufficiently plenty in some form as to be procurable by all farmers, but the large cost of rendering it available as a fertilizer places upon it a high commercial value. And yet the necessity of this element in the renovation of pastures is so imperative that its use for this purpose will undoubtedly be found on trial to be quite as profitable as it has proved to be in field culture.

During the past summer the agricultural editor of the Maine Farmer advised the feeding of meal rations to cattle as a supplement to deficient and innutritious pasture feed, claiming that if judiciously fed a profit would be realized in the operation. It might be reasonably expected that if the practice of feeding meal to stock while at pasture should become general, there would soon be an improvement in the pastures from this indirect method of adding fertilizing materials to the soil. This practice is worthy of the thoughtful attention of all farmers and may in the future do much in solving the question of how to renovate exhausted pastures.

How to stock pastures to the best advantage is a point of considerable importance in the management of pastures. Is it not a fact that one class of animals in a series of years will injure a pasture, while with a mixed stock the same pasture will continue or often increase in productiveness? My experience teaches that the practice of keeping mixed stock—sheep, horses and neat stock, in one pasture is better than to divide the pastures and keep each separate—when the different classes of stock run in the same pasture the grass is fed off more uniformly, one class eating that which is rejected by the other. In this way many noxious weeds are kept in check and completely eradicated that would prove very troublesome where a single class of animals were pastured. It also saves much expense in constructing and maintaining division fences. Of course judgment must be exercised in the number of animals of the several classes as regards the quality and quantity of feed the pasture will produce. If over-stocked and fed too close the sheep would undoubtedly do well while the neat stock might suffer with hunger. Generally, if the pasture is quite limited in area it would not be well to put in a much larger number of sheep than of neat stock. Many careful observers claim that in a pasture that will carry a given number of cows, a like number of sheep may be added and the cows still be as well or even better fed than without the sheep. Other farmers advocate several pastures and to change the class of stock from one pasture to another, from time to time, as the best course to pursue.

In re-seeding pastures it is desirable to know what varieties of grasses are best adapted to pastures. Old pastures are pretty likely to be stocked with "White-Top," but this is not a desirable variety. It will do very well up to the middle of July. Later, no stock will eat it unless compelled to do so by actual hunger. Herds-grass, although the most valuable of grasses for mowing fields, is not well adapted to pasturage as close feeding soon runs it out. June grass and Red-Top are very valuable varieties for permanent pasturage as they start early in the spring and continue growth during the season. White clover is an excellent pasture grass and in permanent pastures that are well cared for it will thrive luxuriantly. It is generally claimed that White clover makes the best pasture feed for dairy cows.

Whether pastures should be close fed or not, is a question still debatable. My experience teaches it to be far the most advantageous to feed quite close. Pastures thus fed not only carry more stock, but continue to improve in productiveness from year to year, becoming well filled with a variety of fine, sweet, nutritious grasses. Those allowed to run up and mature their seed become thin, while coarse grasses and weeds crowd out the finer and more nutritious varieties.

How to treat the stony hill-pastures that so largely bound in several of the counties of the State is a problem with which I have no experience, and I gladly leave it to those whose knowledge enables them to speak with authority. What to do with the pastures we now have, how to restore them to other uses or renovate them for pasturage, are questions vital to the farming interests of Maine. In determining what to do or not to do, let each farmer study his own soil, its location, its fertility and its adaptation to different purposes. When this careful study has been given many of us will find it necessary to make a new map of the farm. We shall not longer rely upon the thin soils and rocky hill-sides, made thin and barren by the washing of the soil into the valleys below. Instead, new lands will be cleared and these worn-out soils will be allowed to revert to forest growth. With these barren hills and sandy plains reclothed with forest growth they will afford to the home, the garden, the orchard and fields, protection from the blighting effects of the drying winds of summer and the rude blasts of winter.

It may here be noted that these lands are of low cash value and their use as pasturage costs little beyond the expense of maintaining fences. If thought more profitable to allow them to revert to wood, then select other and good land accessible to the buildings and well adapted to the growth of a variety of grasses for home pasturage. The next important step is to enclose the pasture with a substantial fence. Let the rule be to fence the stock into the pasture. By adopting this practice all interior field and roadside fences not needed about the pasture can be dispensed with. Fences cost heavily to build and keep in repair—they occupy good land, harbor weeds and mar the beauty of the scenery.

Finally, we need to appreciate in a larger measure the value of pasturage in our system of agriculture. Methods of treatment and renovation must be left to the individual farmer. Attention and labor bestowed in destroying bushes, brambles and noxious weeds, and the application of fertilizers to pastures will enhance the profits of the farmer and add to the value of the farm. The prosperity of farmers can be quite as accurately measured by the condition of their pastures as by their buildings and fields. Neglected pastures overgrown with bushes; cattle few and lean. Clean pastures with a dense turf of nutritious grasses; cattle thrifty, giving prosperity to the happy owner thereof. Let not the words of the wise man applied to the slothful be true of us. "I went by the field of the slothful and lo, it was all grown over with thorns, and nettles had covered the face thereof, and the stone wall thereof was broken down. I looked upon it and received instruction. Yet a little sleep, a little slumber, a little folding of the hands to sleep. So shall thy poverty come as one that traveleth, and thy want as an armed man." Being desirous of learning the methods of practical farmers in the treatment of pastures, I wrote to several who kindly responded. I will now present what they have written as being of more interest than anything further that I could say upon this subject.

Mr. Wm. Downs of Sebec, who is one of the most progressive farmers of the State, favors me with his experience of pasture management as follows:

This question of old pastures is one of the most perplexing questions we have to deal with. I have no manure to spare for pastures and cannot afford to buy commercial fertilizers, so I think the best way for me is to plow and re-seed. I have an old pasture of fifty acres. Five years ago I plowed twenty-two acres of it, sowed it to grain and seeded it to grass. I can pasture three cows on the newly seeded to one on the old portion. I would recommend to plow pastures soon after haying, harrow thoroughly and seed to grass in the fall, using a variety of seed. The next season there would be a good growth of grass, continuing its growth after the old pasture had dried up. My cows give a larger flow of milk while at pasture than on winter feed until the middle of August, after which the pastures become dry. I get more growth on young stock at pasture than in winter with the feed I give them. I think sheep do not renovate pastures, but the pasture will hold its own if plowed and re-seeded once in four or five years. My old pastures are losing each year in productiveness.

Mr. Edwin Doore, an intelligent farmer of Dover, writes as follows: "My success in farming is largely due to the net income received from pasturage. I will give you an outline of the course I pursue in the management of my pastures. I enclose dry land with low swale lands. Sheep and cattle will yard upon the dry portions and in a few years these will become enriched by bringing up from the low wet lands the manure that otherwise would be dropped there if confined to the wet land alone. The low lands naturally take the wash of the higher, and consequently do not need that attention to be kept continuously in grass if the bushes be kept cut. I refer here to cedar and spruce, the pests of our pastures. I venture to say that one-half at least of the pasture lands of Piscataquis County are rendered worthless from these alone. These bushes constantly remind us that we must fight if we would reign, and I will now state my mode of warfare. The time to cut this growth is in November. If the growth is large, cut clean, and take out your year's wood. The following summer burn off the brush, then sow herds-grass and White clover, and you have "killed two birds with one stone." Then keep the bushes off by going over the ground once in three or four years late in the fall when the ground is hard frozen. One day's work at the right time is worth more than ten if the bushes were left to get a large growth. Keep the bushes out and drain off the surface water and our wet rocky lands become the most valuable of any for pasturage as they supply grass earlier in the spring, and an abundant supply late in the season. I estimate the expense of keeping neat stock and sheep at pasture at one-fourth of the cost of winter feed and as a rule they make more growth. Neat stock must have the best of hay and one quart of meal per day to make the same gain as they do at pasture. My pastures produce as much feed as at any time in the past. Moist lands are kept permanently in grass. Dry lands need cultivating (not cropping) and re-seeding. Unquestionably sheep will improve a pasture. They pack the soil and destroy nearly all kinds of weeds. The golden rod is their delight. Were it not for the sheep many of our farms would be overrun by the noxious weeds.

SAGADAHOC COUNTY.

Institute at Brunswick.

The Institute for Sagadahoc County was held at Brunswick Town Hall, February 12th. The day was rainy and as a consequence the attendance was light. There were present of the members of the Board, Messrs. Holbrook of Sagadahoc, Deering of York, Harris of Cumberland and Brainerd of Kennebec.

STOCK HUSBANDRY.

By J. M. Deering.

When we weigh in the balance of reason the many advantages that cluster around a well-regulated farm, we find some to out-weigh in certain directions while others will out-weigh in another. In order to solve this problem it becomes necessary to mention some of the most important advantages, to point out their value and consider upon what foundation they rest. The most important advantage, and greater than all others combined, is the advantage of obtaining by our labor and intelligence a respectable living. In saying a living it seems as though we had covered the whole ground, but getting a living means more than was covered by it fifty or seventy-five years ago, when the soil was new and full of all of the necessary elements to make plants grow, and the wants of those dependent on that soil were so different from what is now called for.

But times have changed since our grandfathers' day, the soil has been stripped of its lofty pines and oaks in the settled districts and subjected to a process of continual cropping, and we are now continually hearing the question, What shall we do to keep up the fertility of our farms?

To be sure there are large quantities of wood still left but the coal has taken its position in the cities as a substitute, and men are now employed in the bowels of the earth in mining it and bringing it forward and into competition with the hard wood of our forests. Perhaps this is well, but it causes the farmers to look about themselves and ask the question, What shall we do to keep pace with those engaged in other industries? This might be termed a disadvantage, but let me say as long as wood and logs sold for a good price, we turned our attention to that branch of business and let agriculture take care of itself. To be sure there is unmeasured wealth in the forests of Maine yet; but I think it would be safe to say that out of the 64,000 farms one-half of them are destitute of heavy growth, and human life is too short for us to think of raising another crop for our own benefit. So we find it necessary to grow some other crop that will mature in a shorter period.

We are well aware of the fact that agriculture has made good progress within the last fifty years. Farm implements have been improved from the hand scythe to the mowing machine; from the flail to the threshing machine; from the wooden plow to the one whose furrow board is made of glistening steel and mounted on the sulkey; from the spike-tooth harrow to the different pulverizers we now call perfection. Even the old style of spreading manure is going out of fashion, although as yet nothing has been brought out that is quite to perfection, though some farmers think it is by using a manure spreader. Corn and all other seeds can be planted by different machines, improved in such a manner as to be coming into practical use. The hay tedder, the horse rake, the horse pitch-fork and many other labor-saving machines are making their way into the markets and upon the farms. All these things weigh heavy in the balance and must be considered as an advantage upon the farm. Commercial fertilizers have been too well ventilated for any one to say that an honest brand isn't good. Certainly they contain the very elements we need to fertilize our soil, and under some circumstances they will pay a profit; but it is my opinion, drawn from my experience, that it is too near an even thing to depend wholly upon them to fertilize our soil. When we do this we place ourselves at the mercy of the manufacturers, and when we do that, up goes the price of nitrogen and we are ruined. Forty years ago nitrogen had no established market value, but by the strategy of influential and enterprising men, through advertising its merits in the columns of our agricultural papers, farmers have been induced to use these manures to such an extent that to-day nitrogen has a well-established market value. We are told by chemists that certain brands are worth say from thirty to forty-five dollars per ton. I am well aware that a portion are made at abbottois where waste materials accumulate and all the cost to the manufacturer is simply the cost of labor in manufacturing it. Now that the boom is all over with commercial fertilizers, and farmers are coming down to solid facts, it is the universal sentiment that commercial fertilizers are too much per ton. What makes a ton of fertilizer cost forty dollars? I never was let into any of the secrets of this business, but by observation and what little I think I know about business, it is something like this: raw material, twenty-five dollars; mixing, five dollars; cost of selling, five dollars; interest on investment and profit to stock-holders, five dollars; making forty dollars. Cannot the farmers manage some way to save this last fifteen dollars? If they could, then perhaps it could be called an advantage to the farm.

The silo for preserving green fodder has been introduced among the farmers. It has been an open question among agriculturists and has been considered by some as a shy monster, although those who have raised the corn and have put it up in good condition and have fed it scientifically, seem to think it is a wonderful invention. They say it helps out a short hay crop and will make more milk and better butter than dry corn fodder. This is a fodder I have had but little experience with as yet, but hearing so much said for and against it, I determined to build a small silo and try it myself. I planted three acres of corn and stored it in a silo, and am feeding it to steers at present. This subject was ably aired by Prof. Alvord at Auburn. I do not wish to borrow any of his address, but, in summing up his remarks and his experiments, I understood it in this light: Although the silo is not a bonanza upon the farm yet it is practical and the majority of farmers would find it profitable to have one. Reports by those who have silos are becoming more reliable of late. The craze is nearly over and we are coming down to facts. With my little experience there seems to be but one problem to solve to satisfy me of a success and it is this: Can I fertilize my soil for grass by raising ensilage corn as well as I can by raising some other crop? Some one may say it costs as much to raise it as hay, because we must apply manure every year. But we have to manure every year for other crops. If a farmer has a farm that is not adapted to the growing of hay I think it is a settled fact that a silo will pay him well. I know a man in my town who cultivates thirty acres of light sandy land, and he keeps thirty cows upon the thirty acres the year around, with the exception of grain, and his cows always look healthy and in good condition. I know of another man in my vicinity that has doubled his stock within the last four years. Now let me say, farmers, look into this method of preserving your fodder carefully and candidly. Try it yourself. The expense will be small. What a man learns by his own experience is worth more than what some one tells him, and if we find the silo practical, and I dare say we shall, it certainly will be an advantage upon the farm by opening up a way to increase our stock husbandry.

What are considered the necessaries of life to-day, fifty or seventy-five years ago would have been termed luxuries. Then, the women did the milking, fed the pigs and hens, made the butter and cheese, spun the yarn and wove the cloth to clothe the family, and in some instances took the whole care of the barn. The churning was done in an up-and-down dash churn and it took two or three hours of hard labor to bring the butter. Well can I remember of seeing my mother in the winter churn four hours and then the butter didn't come. The cheese press was a home-made structure with a rough handle for a lever to press out the whey. The cooking was done by an open fire-place. The Christmas dinner was prepared in the Dutch oven. I have seen brown bread baked upon a cabbage leaf. Indian bannock, salt pork and potatoes were considered a good living then. It would have been a hard task to have told the kitchen from the parlor. All the difference there was, if any, was the sanded floor. Carpets and gold-tinted paper were not heard of then. There has been a gradual change going on within this time, and men have learned to appreciate woman's good qualities, and in a greater measure have lightened their burden by obtaining modern improved implements for household work; cook stoves all equipped with apparatus of every description for cooking purposes; washing and wringing machines, churns and butter workers; creameries, cheese and butter factories have been established; men do the chores about the house and barn—if they don't they ought to, and in most instances do the churning. Many farm-houses are decorated with pictures, musical instruments, house plants, book-cases well filled with volumes of good books; carpets, rooms papered, parlors well furnished and a spare room well fitted up for company, and the good wife busying herself in making frosted cakes and nice pies. Every Saturday or the day the grange meets she will have the house all cleaned up, dishes all washed, hair crimped, and a basket well filled with goodies for the festival, enjoying the privilege of voting and discussing matters concerning the rights and the welfare of her husband, self and family. All these things must be considered advantages on the farm.

Now let us compare our condition, circumstances, mode of living, society, &c., with other sections of the country, and see if we have any reason to complain. Many times we have heard that now worn-out saying of Horace Greely, "Go west, young man," and many have heeded the advice. We have had the advantages painted in bright colors, circulars and placards posted in every depot and hotel throughout the east, advertisements in most every paper enticing our young men to go and settle up the great Northwest. But little have we heard of the thousands of common farmers scattered through the country whose houses are shingled with grass and plastered with mud, while the starry heavens is the shelter for their cattle, sheep and horses. A man who lived in the West told me that he cooked his bacon with ears of corn that he raised, and it was the cheapest fuel that could be obtained. We have read of the terrible cyclone cutting its path through different sections of the country, dealing out death and destruction for hundreds of miles; floods undulating the greater river valleys, destroying property and lives; water famine, grasshopper plagues, and the farmer driving through the storm with the thermometer down to minus 30° endeavoring to herd his cattle under the lee side of some bluff. These may be exceptions but they are too true. Now go west young man if you please, but first take into consideration that you must depend upon New England to buy your productions. Take into consideration our schools, churches, institutions of every description near at hand, our market facilities, our society, our picturesque scenery, our climate, free from the western blizzard and the Kansas cyclone, our never-failing crystal waters, our good roads, our watering places, our granite and building material, our comfortable buildings, with good facilities for caring for our stock in winter, and our grange, which is a good school for any young man or woman. Consider these things if you please, and you will call them advantages to the Maine farmer.

As I have mentioned a few of the many advantages that can be derived from the resources of the farm, let me say they can be obtained only by judicious management. In order to produce a revenue sufficient to obtain them, it requires cash to produce some of these advantages, and it is evident that we have them, and they have been obtained by the revenue from the farm and the revenue has been obtained by the cash received from the products of the farm. What are the products of the farm? Why, they are beef, butter, milk, cheese, mutton and wool. These are the products derived from stock husbandry. Field crops such as corn, grain, fruit, etc., are farm products, but they can only be produced with success by having stock husbandry coupled with them, because stock husbandry produces the fertilizing material to grow them. Stock husbandry seems to be rather an important industry as all the crops of the farm depend upon it for their plant-food elements. It also represents a vast amount of wealth. I will give a few figures to show its magnitude. The report of the United States Commissioner ending January 1, 1885, gives the number of cattle in the United States as 42,547,307 head, valued at $1,116,715,703. Value of sheep, 119,902,706 dollars. Now it is given by good authority that the gross yearly income of stock is nearly one-half of its real value. To prove this, will say that the cattle of this country are valued on an average at $23.62 each. This would be only $11.81 yearly gain. This estimate is for the whole country. The cattle of the State of Maine are valued $27.42 each, this would give $13.71 yearly growth. In order to make this income we would have to grow each animal 343 pounds per year. Does this look unreasonable? According to my own experience I should set it higher than these figures. The State of Maine has 351,014 cattle valued at $11,643,353; 577,266 sheep valued at $1,627,806. Total value of sheep and cattle $13,271,153, with a gross yearly income of $6,635,576. Of course this is approximated, but I think it is safely estimated.

The question might arise, How can we obtain the highest price for our hay forage and grain produce from our farms? The answer should be, by producing flesh and manure. As manure is considered by many farmers as a waste product, I think some fail to give stock husbandry credit for it. Right here let me give an illustration. A few days ago one of my neighbors wished to sell a pair of oxen. I called to see them and after talking some time in regard to the value of the oxen the gentleman began to complain about the price of beef.

"Why," he says, "you have only offered me just what I paid for them last October. I can't take that, I should lose the keep." I said to him you have a fine pile of manure here, how much have you in that pile? he answered, "about forty cords." Well, I said, if I cannot buy your oxen I will buy your manure, and will give you five dollars per cord for it. He scowled at the offer. Well, I said, if you will put it into my field just yonder I will give you six. "That's a good offer," he says, "but I cannot sell it at any price, my farm cannot do without it. I could not raise anything to live upon next year if I let that go." You can equivalent it in commercial fertilizers, I continued. "Oh," says he, "that is the last resort. I should not dare to chance it." Now I dare say this is one of the thousand instances of this same character. Manure is a waste product, but money cannot buy it of an intelligent farmer. It is better than gold to him, it grows his crops and his crops he cannot do without. Perhaps you would criticise me if I should tell you that the manure made from a steer two years old fed in such a manner as to be made to weigh 1350 pounds is worth thirty-three dollars. I will not take the responsibility, but there has been an actual test made at one of the experiment stations in this country, and these figures obtained, and I am perfectly willing to endorse them. Now, if we should happen to sell a steer for a few dollars less than he cost by reckoning our hay at its market value, we would not be losing anything although it might seem that way. Let us bear in mind that the manure is going to grow our crops. We will admit that ten cents a pound is a great deal better than seven, but it makes no difference what beef and butter bring we must have stock husbandry, because we cannot live without it. Let me give another illustration. Let any farmer or any business man run a grist mill and if he put two bushels of corn into the hopper and it only ground out one bushel of meal he would probably think that there was some trouble with the mill; well, if he looked the mill over and discovered a small place around the stones where the meal worked out and ran down into the stream, he would at once decide that to continue running without stopping the leak would result in his financial ruin. How many farmers are there to-day that are grinding out the products of their farm in a mill in the shape of a cow or steer and letting a portion of their grist go to waste by not preparing a cellar for their manure. The liquids are one-half of the manure if properly saved. No farmer can afford to allow this waste to occur upon his farm and substitute it by purchasing fertilizers. We should place more value upon farm-yard manure. Now I will give you experiments in feeding to show that some stock has to pay more than one-half of their value yearly to make up for the steer that has the unfortunate fate of being wintered in a cold barn, fed upon swale hay and straw and dry corn stalks, never tasting grain, and losing nearly all the flesh he has made in the summer season. A neighbor of mine, who keeps a strict account with his farm operations, gave me the record of his cows for the last two years. His farm consists of fifty acres, and within the last fifteen years he has tried different methods of disposing of his hay, some years selling nearly all, some years a part, some years selling his milk, and some years making butter. He has settled down to making butter and raising pigs and calves fed from the skim milk, and you will notice by the records that this is the best method for him because his cows pay him the best,

First account with 5 cows in 1884.

Hay fed in 8 months ...... 14¼ tons.	
Cost of grain	$ 73.24
14¼ tons of hay at $15.75....	225.60
Pasturing 5 cows at $7	35.00
Medicine	4.00
	$337.84

Cr.

By 6,784 qts. milk sold	$271.66
" 375¼ lbs. butter	98.43
Calves sold	19.20
	$389.29

Leaving $51.45 or $10.29 each after receiving the market price for hay consumed.

Second account with 9 cows, 1885.

To hay consumed, 22½ tons at $12	$270.00
To grain consumed	172.80
" pasturing	40.00
	$482.80
Int. and keeping cows good..	45.00
	$527.80

Cr.

By 2,275 lbs. butter	$579.47
" 3,989 qts. milk	167.04
" skim milk	53.00
" 2 bull calves	15.45
" 4 calves raised	25.00
	$839 96

This gives him $34.90 per cow after saving $12 per ton for his hay consumed, and the manure for care.

This gave him a profit on his hay, a profit on his cows and the manure left for care—two profits, and yet some say stock husbandry doesn't pay in Maine. I sell milk and have been in the business for sixteen years, and I have read somewhere that the man who makes a practice of selling his milk will in time sell his farm by the gallon, while the farmer who makes butter will fertilize his farm and make it better. If this be true you see I have a hard business. I have never had much experience in the profits of butter, but am willing to call the two interests even, as I wish to submit a few of my own figures. In order to make it short I will give the average cost of feeding my cows as I have fed them for the last ten years, reckoning the hay at $12 per ton and the grain at the market price. The highest cost per year per cow was $56, the lowest was $43.25, the average was $49.62 per cow per year. The average gross income was $92.63 per cow, the net was $43.01. This was by reckoning the milk what it sold for in the market, the highest price being eight cents at retail, and the lowest 4½ cents by the can. This would not give a fair average for milk sold only one year for eight cents, three years for seven and six years for six. Averaging this gives within a small fraction of six cents per quart for ten years. This would give an average yield of four and one-fourth quarts per day per cow for ten years. This looks like a small stream of milk, but it is a continual one. At this yield we have $43.01 profit as we call it or a fraction less than twelve cents per day per cow, by reckoning the hay at $12 per ton and the grain at the market price. These figures are cast from the footings of each year's business, and only the milk sold is taken into consideration. Two families have used all the milk they needed. From the cows kept upon the farm all the calves raised have been supplied until weaned. Then the hay doesn't cost $12 per ton to raise it. As near as I can figure it costs me from three to six dollars per ton to raise it, with manure made upon the farm, by the different methods of producing it. Then we have the manure left. So you see in this way of figuring out the profits we have omitted to take important items into the account, which if figured would go to the credit of the cows.

Now let us take a pound of butter and figure for a moment. If butter is selling in the market for twenty-five cents per pound, and if we figure our hay and grain at the market price and obtain an answer that it costs twenty-five cents to produce it, we would naturally say that it does not pay. Well, it looks so, to be sure, but have we figured the whole product when we get through with the pound of butter? Why, certainly not. There is another product in the shape of fertilizers that we call a waste product. But doesn't it supply the elements to grow our corn, vegetables and all other farm products that go a long way in supplying us with the many advantages I have mentioned, and which we would know better how to appreciate if we were deprived of them? I have given you the ten years' practice with my cows. To be sure, they are not large results, but they are average results. It isn't the record of some particular cow, of some particular breed fed to its highest capacity, and often over-fed and spoiled for the purpose of advertising the breed, that does the average farmer any good.

I wish to give you an experiment in feeding a pair of two-year-old steers for eleven months. Bought the steers July 8th, 1884; they girted just six feet. Gave one hundred eight dollars for them; they ran in pasture until October 1st; ran in field until November 11th; tied up and fed until June 10th and sold for two hundred three dollars. They consumed forty-one bushels meal, four hundred pounds middlings, cost of grain forty-two dollars and sixty-five cents, pasturing ten dollars, consumed three tons six hundred pounds of hay at six dollars per ton, nineteen dollars and eighteen cents, making the steers cost one hundred eighty dollars and forty-five cents. This gave twenty-three dollars and forty-five cents profit, and the manure.

Now let us figure another way. They cost, not reckoning the hay, one hundred sixty dollars and sixty-five cents. What did we get for the hay fed? We got for three tons six hundred pounds, forty-two dollars and thirty-five cents, or thirteen dollars per ton, and the waste product. I can give you more results in feeding for beef. I never wish to sell a ton of hay when I can get twelve dollars per ton for it by feeding it to stock. I wished to give the figures with the cows to show that in figuring the profits on stock husbandry we are continually having advantages coming to us that we are not apt to appreciate in figuring the profits in our business. The kind of stock to be kept, the manner of feeding, whether we shall produce for the dairy or the shambles, are both important matters to be considered. In passing, allow me to suggest that whatever we feed, animals or plants, feed with a liberal hand. Some men think there must be some magical way in growing large animals. To be sure there is a secret, and it is simply this—good breed, good care and good feed. It has become an established fact, that the mammoth old ox loaded with fat is not the animal that brings the highest price in the market. It is the fine-cut steer, say from three to four years old, that has been fed in such a manner as to make a continuous growth from the time he was dropped until matured. By this method of feeding, the meat keeps pace with the bone, which is the most practical and profitable.

Low prices for beef seem to prevail at present, although dairy products are selling at fair prices. Some farmers seem to be complaining on account of being obliged to sell their oxen and steers at the present market value. Let us look this part of the question square in the face and bear in mind, if low prices prevail in the State of Maine they prevail in every State in the country. All products the farmer produces, with the exception of what is consumed in his own family, are exchanged for cash or some other commodities to make up a respectable living. Now, what is the difierence whether we get twelve cents a pound for our beef and pay twelve cents for our sugar or six cents for our beef and six cents for our sugar? It isn't the low prices that will starve the farmer. All that is required to make a healthy business and prosperous country is an honest and an equitable system of exchange. In competing with the West, let me say that it is not the choice western steer that we need to fear; it is the longhorns of Texas and Colorado. It is only the stall fed western steer that make the choice roasts and sirloins and they command a good price now as do choice Maine steers. Steers cannot be raised upon the plains and transported one or two thousand miles where the corn is raised, and fed, say from six to twelve months, without costing something. When the western farmer provides shelter for his cattle and spends his time feeding them, taking the cost of transporting into account, it will not make so much difference, after all, as to profit whether the steer is fattened in Kansas, Colorado or Maine. I think we allow too many of our cattle to go into the market half fattened, which makes hard business for the raiser and also hard for the purchaser. We do not discriminate as we should between the fair and the choice steer. The better the steer, the nearer we can meet the western farmer in competing, and when we get left it will be with the poor quality.

I have known farmers to sell their oxen or steers and place their money at interest, perhaps put it in the savings bank. Is this the best course? To be sure it is handy to have a good bank deposit to fall back upon, or as we might say, for a rainy day, but it seems to me to be a wrong practice for farmers to skin their farms for the sake of having a few hundred dollars at interest. Any man who possesses the ability to save a hundred dollars from the products of his farm has the ability to invest it in his farm, and instead of paying the man whose hands are as soft as silk to invest it for him and remit to him three or four per cent interest, can invest it in his farm and receive ten per cent. Farming needs working capital, as does other business. I know a farmer who has practiced this method, and I dare say he is not alone. His soil is good and he feels quite rich with the few hundred dollars he has in the bank, but his farm, Oh dear! if that is getting rich deliver me from it! His fences stand aslant, the shingles upon his buildings hang by one corner, you see day-light through the cracks in his barn in a cold day. He remarked to a neighbor that how he got money was by not hiring much help. "Why, I can cut my hay with only a boy to help me." The neighbor replied, "Well, in a few years more the boy can cut it without you." We must admit that home is a home if it is ever so homely, and if it is as good as our circustances will permit it is good enough, but what better collateral does a farmer need than a well stocked, well cultivated and well regulated farm, surrounded by nature's gifts and the comforts of life.

In conclusion, let me ask, what would be the condition of the farmer if there was no stock husbandry in the State of Maine? Every interest connected with agriculture would be unhealthy. There would be a meager amount of corn, oats, barley, wheat and but little fruit. We could not have the improved farm and implements and, further, we would not need them. Stock husbandry is the foundation upon which all these advantages rest. Without it there would be no agriculture. So let the wiseacres of to-day tell us that beef and dairy products can be produced only at a loss, but let me say they are the foundation of Maine agriculture; they are the salvation of the farmer. If what we have to-day is so important, why not increase it, double it and double our advantages also. It can be done. Excuse me for putting it so strong. It is my honest conviction and I say again, it can be done by raising more calves, corn, oats, wheat, barley and all other farm products; by looking more closely after our waste product, in the shape of manure, by preserving our grain fodder if we find it practical, by clearing the bushes out of our pastures and clearing up the low lands, which are the best grass lands, by studying more thoroughly the secrets of animal and plant growths, by adding strict business principles to our farming, by feeding better and producing such a quality of beef and dairy products that will establish a reputation in the market that will command the good price, by keeping our stock in comfortable quarters, and by watching the market and selling when we get the good price. If we should succeed in doubling our stock husbandry what would then be our condition? Why, we have doubled our advantages; and that isn't all. We could raise forty million dollars' worth of farm products yearly instead of twenty and our gross yearly income would be eleven million instead of five and a half, our stock would be worth twenty millions instead of half that amount, and our farms would be worth twenty-five to fifty per cent more than at present, and prosperity would everywhere abound.

SOME PHASES OF THE POULTRY QUESTION.

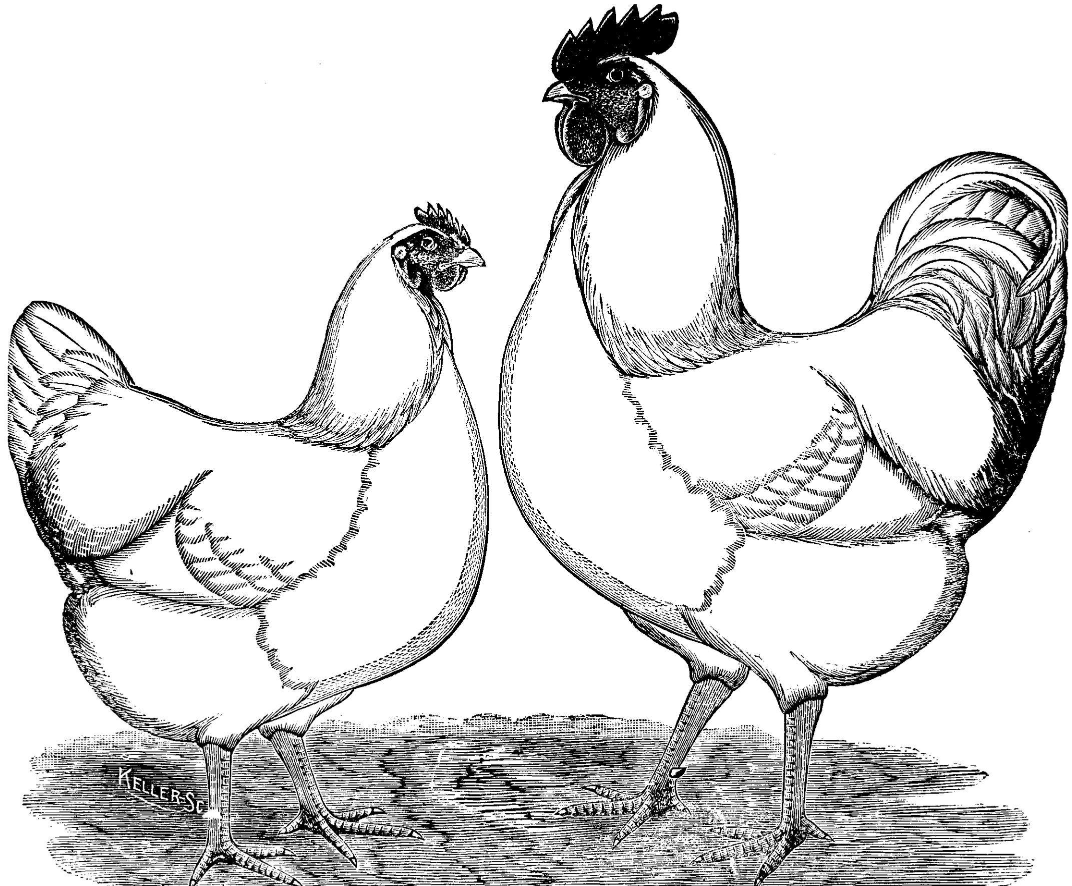
By Dr. G. M. TWITCHELL, Readfield.

The past few years have witnessed a remarkable growth of a new industry. Throughout our State the fact has been gradually gaining ground that there was profit in poultry keeping. In our discussion of the question the same leading points present themselves as in former years, for upon their solution hinge the profit or loss of the business.

To-day the great question to be decided by those engaging in the business is, what breed will give me the greatest profit? In solving this, the location, condition, and tastes of the individual must be considered. No breed combines all the good qualities, none but has its merits.

For our climate and soil, I believe that we have four families best suited, the Leghorns, Brahmas, Wyandottes and Plymouth Rocks. Bear in mind what I said in reference to other breeds, and to the tastes of the breeder, else my remarks may seem to reflect upon some who are making a success with other and entirely different varieties. The demand of the market is for large, fresh eggs, and poultry with yellow legs and yellow meat. The breeder whose desire is to reach and control this market can have nothing to do with the blue or black legged and dark meated fowl.

The value of these is in their egg-producing qualities, yet they do not excel those named, which have in addition flesh of the color desired by epicures. For this reason I am led to advise our farmers and small breeders to select from one of the four varieties named the breed best adapted to their fancy. In so-called fancy poultry breeding this question of utility does not enter in, for the object



WHITE PLYMOUTH ROCKS.

there is to satisfy the taste for color, shape, and style, rather than the intrinsic qualities needed by the general breeder. Of the Leghorns we have the White, Brown, Black and Dominique. But few of the Blacks are bred for the same reason that we pass by the Hamburgs and Black Spanish—color of leg and flesh. The White and Brown are bred with both single and rose comb, giving us four distinct varieties from which to select. These are among the best layers known, and for their size, produce good poultry. To-day there is not so much difference between the larger and smaller breeds, in their laying qualities, as formerly. The Brahmas are among the best of all winter layers, hardy and healthy. It is useless to deny their true worth or attempt to give them a false position. The tendency to sit has, by careful breeding, well-nigh disappeared, until in many families we find them as good layers as any of the smaller breeds. The one objection to be made to them is that they mature slowly, though this is fast disappearing under the careful matings made by experienced breeders.

Of the Plymouth Rocks, too much cannot be said, for they are the ideal farmer's fowl. Out of the long-felt need of a breed combining the greatest number of desirable traits, came this, and where the self-same object has been kept in view, they show steady improvement. In our own State we have what is to be one of the popular breeds of the future--the White Plymouth Rocks—originated by O. F. Frost, Monmouth, Me. These are pure Plymouth Rocks, save in color, and after years of careful breeding have become well established and take their place among the best. The Wyandottes are but another sign of that spirit of unrest that prevails in our grand old New England. Not content with what we have, but reaching after something better, new breeds appear, and this desire first brought to notice the breed over which the poultry men of the country are running wild. Not as large as the Plymouth Rocks, they in other respects divide the honors with them, and in shape, color, style, eggs, and poultry, are among the very best. So long as the desire to realize gain is uppermost in the minds of the fancier, we cannot have too many varieties, for each one as it appears becomes an educator of the public, and there results a better appreciation of poultry feeding, and consequently, greater profits for the breeder.

Speaking, as I now am, to those whose chief desire is profit from their poultry, I can but advise that one of these breeds be selected as the foundation stock upon which to build. Each has its individual characteristics and requires different treatment. For this reason one variety is better than two or three. The indiscriminate mingling of several, no matter how good each may be by itself, will surely bring failure and disappointment. A Leghorn is by nature active, and constantly in motion, will eat its food and digest it while moving about the pen, but the Plymouth Rocks are heavy and sluggish. Feed these as you may the Leghorns, and disease and death will soon appear in the flock. Every ounce of food consumed beyond what is required to nourish the body and produce eggs is more than wasted, for it adds to the fat and fat soon provokes disease. Of course, if one is preparing for the market, this fat is just what is wanted, but the fact that fat hens will not produce eggs as they should is too often overlooked. Like an animal or a person, they need to be in a good, healthy condition, nothing more.

Add to this, and the same result follows, as though the fowl was growing poor, while in addition the system is being clogged and rendered unhealthy by the accumulations of fat. This point needs to be emphasized, for here hinges the profit or loss of the year's operations. Suppose a person keeping one hundred hens feeds daily one quart more than is necessary for health and productiveness, what is the result? Three hundred and sixty-five quarts are more than wasted. Instead of one quart, usually two or three more than are necessary for the best health of the flocks are fed daily. We need to study the economy of feeding if we would make poultry breeding financially successful. A few birds may be kept and pampered but, seeking profit in the business, we must know the least possible amount necessary to preserve health and secure the largest production of eggs. This may seem a trivial matter, but here is where the whole question hinges. Fowls over-fed can neither be healthy nor productive.

With the growing chicks this does not apply, for until fully matured we want to make bone and muscle as rapidly as possible. By feeding with this one object in view, and then selecting from those that mature the most rapidly, we have been improving our poultry in size and quality. Continue this practice and we hasten growth and maturity and fix these tendencies. Neglect these seemingly little things, and our flocks will rapidly revert.

It has been this aim on the part of the founders of the Plymouth Rocks and Wyandottes, that has given them superiority over other varieties. From the day the chick leaves the shell, until fully grown, there must be no neglect to supply all the bone and muscle producing food it will consume, else loss is incurred that cannot be repaired. A stunted chicken will never be as large, healthy, strong or productive as one that has been carefully fed from the first.

Do you ask, *What* shall we feed? I answer, not corn, for that contains seventy-eight per cent fat, and only eleven per cent of muscle and one of bone. The feed that contains the greater per cent of muscle is what we need until the time comes for fattening. Wheat then must form the staple article of food. Grind together twenty pounds of wheat, twenty of oats, ten of barley, ten of corn and ten of bran. Mix this into a stiff paste with sour milk, and bake until it will crumble. This cake with milk, *no water*—is the best food that can be given. After the first week keep a dish of wheat, oats, and a small per cent of cracked corn where the chicks can reach it, undisturbed by the hens, and be sure that at no time is this dish empty. We do not realize the value of milk as food for growing stock. Skim-milk is worth two cents a quart to feed to growing chicks, but to realize this, we must feed regularly, that steady growth be secured. Very much depends upon regularity in feeding, more than one would suppose who has not practiced this course for years. In fattening, corn and corn-meal must take the place of other grains, for this should be a forcing process not to extend over ten or twelve days, during which time, from a pound and a quarter to two pounds should be added to the dressed weight of each chick.

The prime essentials of success do not change. These have been dwelt upon at such length in former papers (see Reports of 1884 and 1885) that I will not take time to more than mention them here. Cleanliness in the pens, pure air by means of ventilation, sound grain, without which we cannot have health, fresh water, regularity in feeding, and careful attention to the amount necessary for health and productiveness—these underlie all success. Neglect either and failure will result. Because of the necessity of attention to these little things, not every one can succeed in poultry raising. One must be fitted by nature for the work if they would realize the highest success. Such a person will find a net profit of two dollars per head easily obtained, even at the low prices secured during the past year. It is important that we start right in this, or any other business.

For this reason I have named the breeds best adapted to our climate and our conditions, and suggested the care and attention necessary to realize the greatest possible margin of profit. Our worn-out fields, pastures and orchards are wanting just the labor the hens may perform in order that they may be improved. There is no place where hens will pay so well as in an orchard. Dr. Sturtevant, in his experimental work in New York, enclosed two per cent of a plum orchard in a hen-yard, and found that the curculio stung but three per cent of the fruit, while that upon the trees fifteen feet outside the fence was stung to the amount of sixty-three per cent.

Give the hens the run of the orchard. Stock it with poultry sufficient to keep down the grass, and stir the soil. Though the roots be exposed sometimes, the growth will be heavy, and the fruit of a superior quality. Within the past few months, I visited an orchard set in 1884. The land was plowed and cultivated that season. In the fall, part of it was fenced and stocked with hens, an l to-day the trees on that portion are a third larger, and present a far more thrifty appearance than the remainder. I believe that those planting young orchards would find the investment profitable in ten years' time, if they should confine the hens there, and receive little or no income from them. If we would but centralize our efforts greater success would result.

All through our State are farms where men are grubbing a bare existence, that, set with trees, and enriched by the hens, would yield a satisfactory income. These lands have become exhausted, and are hungry for the work and food the hens would bring. The future of Maine is in the improvement of her farms. The inland waters will sometime hear the sound of busy wheels, but meanwhile we must develop our resources by improving and reclaiming our farms. To-day no State in the Union offers greater inducements to her young men than Maine. Hard work, without which no man deserves success, will bring as good results here as elsewhere. Dairying, orcharding, and stock breeding will be found the avenues to prosperity. We have not the broad wheat fields or grazing lands of the far West, but we can produce more grain to the acre, and grow beef and poultry at as good a profit as when corn is twenty-five cents a bushel. Every section of country has its advantages, and ours is the nearness to the best markets of America. This advantage cannot be taken from us, and so long as we produce a choice article, the market is open to receive the same at a profit to the grower.

The West is giving more attention to poultry raising than formerly, and we must improve the quality of our stock if we would secure a profit. Competition is already close, and the lines are drawing closer each year. Our only hope for the future lies in careful matings and systematic feeding and breeding.

Promiscuous poultry breeding is just as sure to bring loss to the breeder as careful selection and choice breeding will give success. There is no middle ground. In the multiplicity of breeds may be found one best suited to the tastes and to the location of every breeder, and holding to that one, year after year, the greatest profit will be realized. In addition, there must be no inbreeding, save in direct lines, as we may undo in one season all that has been accomplished in years. Fresh blood must be introduced annually. One fact to be borne in mind is that the male bird is one-half of the flock, and upon the selection of the male for breeding, fully one-half depends. Poultry breeding is made up of little things, minute details, yet these same principles underlie all success in business everywhere.

Thousands of dollars are being scattered over our State annually for eggs and poultry, and many a farmer to-day realizes that there is more profit coming from the hen-yard than from any other department of the farm. There is no danger of over-production. We may increase and multiply our flocks so long as we are able to give attention to care, feeding and cleanliness in all the details, and still realize profit. Inexpensive buildings, scattered flocks, large runs and clean pens will insure success.

If the boys and girls can be interested in some such field of labor, many a home may be made happy and cheerful in years to come which otherwise will be desolate. The drudgery of the farm has driven many a boy out into the world, with no desire but to get away from home. The young people may, by cultivating a love for poultry or stock breeding, be led to see that there is a bright and sunny side to farm life, and in years to come be saved to the State and the farm. Here, my friends, is where we may make this poultry business of the highest service. In breeding there will come a desire to know the laws of breeding, and this opens a field of study that will do much to relieve the monotony of farm life, and give an object worth striving for. So, then, interest the children early in something on the farm, giving them, as an incentive, the profit they may secure. In this way we may realize that poultry breeding is a systematized business, and that it is worthy the careful attention of any man.

KNOX COUNTY.

Institute at Camden.

A very successful Farmers' Institute for Knox County was held at Camden, in Megunticook Hall, February 24th. The attendance was large through the day and evening. The subjects selected for consideration were "Cattle Husbandry" in the forenoon, "Management of Fairs" in the afternoon and "Farm Accounts" in the evening. The subject of the Management of Fairs elicited a full discussion.

FARM ACCOUNTS.

By Prof. WALTER BALENTINE, Professor of Agriculture, State College.

The desirability of the adoption by every farmer of some system of farm accounts has been so thoroughly and ably discussed by the agricultural press of the country, and has come to be so generally admitted, that it is unnecessary to present any arguments in its favor.

Some of the reasons why the keeping of such accounts is not more generally practiced are: 1st. The business of farming is of such a nature that it will furnish a comfortable living to the proprietor of a farm who tills his soil with his own hands, while expending much time in unprofitable labor. The larger portion of the actual necessities of life are produced upon the farm; and it does not require a large surplus production with which to purchase the necessities that are not produced by the farmer, and in addition, those luxuries which have come to be looked upon as necessities. 2d. The idea prevails with a majority of farmers that the time required for keeping farm accounts in a manner to show whether the year's operation has been profitable or the reverse is more than a farmer carrying on a small business can afford to devote to it. 3d. The methods of keeping farm accounts that have from time to time been presented to our farmers for their adoption have often been too complicated for those not familiar with accounts.

To overcome the first obstacle to keeping farm accounts which I have mentioned is the most difficult. I am inclined to think that it never will be overcome until the desire of farmers to make more than simply a living from the cultivation of their farms becomes sufficiently strong to lead them to expend more thought on general farm management.

In the accompanying forms for keeping accounts I have aimed to reduce the second and third objections to a minimum. No claim is made to originality. The forms are those in use by many merchants who are doing a small business. They may be found in the ordinary text-books on book-keeping. Neither is the claim made that these are the best forms in which to keep farm accounts. They are presented as forms which will serve all ordinary purposes; they do not require that very much time be devoted to them and are simple and easily understood. All the books required are a pocket memorandum and a ledger to which the records be transferred in proper form.

For illustrating this method of keeping the general farm account the examples have not been taken from a real account and do not represent actual transactions. They serve the desired purpose, however, as well as they would if drawn from the books of one engaged in the business of farming.

In these accounts it is assumed that the farm is under obligation to board the farmer, to pay all bills that may properly be charged to the farm, including fair wages to the farmer and his wife. If anything is left over and above this, it represents the profits on the investment. If the farm falls short of doing this, the balance represents the loss to the farmer.

At the time of commencing the accounts an inventory or valuation should be made of the farm, buildings, stock, produce and farming tools, including also cash on hand with which to do business. This shows the net capital invested. An example of such an inventory is given below. The inventory should be extended on the first page of the ledger. The accounts can commence with any month in the year, though in this form the first day of January is taken for an example.

INVENTORY, JANUARY 1, 1885.

60 acres arable land	$4000 00
40 " pasture "	
20 " wood "	
Farm buildings	
12 cows at $60	720 00
6 two-year-old heifers at $35	210 00

6 one-year-old heifers at $20	$120 00
50 sheep at $4.00	200 00
4 breeding swine at $15.00	60 00
2 horses at $150	300 00
35 tons hay at $6.00	210 00
300 bushels oats at 45 cents	135 00
7 tons oat straw at $4.00	28 00
50 bushels potatoes at 50 cents	25 00
Purchased feed on hand	25 00
Farming tools on hand	500 00
Cash	500 00
	$7033 00

All business transactions pertaining to the business of the farm, after the taking of the inventory, should be entered in the pocket memorandum book at the time they transpire or as soon thereafter as is practicable. Trust nothing to memory.

The following form gives the farm memoranda for a single month:

FARM MEMORANDA.

1886.	Jan. 1,	Sold C. K. Mitchell 50 lbs. butter at 35 cts.	$17 50
	1,	Hired C. H. Fuller for six months for $26.00 per month and board.	
	4,	Paid cash for blacksmith work	3 25
	6,	Paid C. H. Fuller cash on account	5 00
	8,	Sold C. K. Mitchell 50 lbs. butter at 35 cts.	17 50
	10,	Rec'd cash from sale of beef cow	40 00
	11,	Paid cash James McIntire	10 00
	15,	Sold C. K. Mitchell 50 lbs. butter at 35 cts.	17 50
	15,	Bought of Charles Drew 50 bu. corn-meal at 70 cts.	35 00
	18,	Paid cash C. H. Fuller	11 00
	19,	Paid cash James McIntire	8 50
	22,	Sold C. K. Mitchell 50 lbs. butter at 35 cts.	17 50
	29,	Rec'd cash from C. K. Mitchell	50 00
	29,	Sold C. K. Mitchell 50 lbs. butter at 35 cts.	16 50
	29,	Bought of C. K. Mitchell groceries	8 50
	29,	Bought of Chas. Drew 1 ton cotton-seed meal,	30 00
	29,	Sold 100 bu. oats at 45 cts	45 00

At the end of each week or at least as often as once a month the items that appear on the memorandum book should be transferred to the ledger. For the ledger I have selected the form with a double money column at the right as appearing to be the most desirable. The form of the ledger, however, is of no great importance.

In transferring the items from the memorandum book to the ledger the name of the individual with whom an account is opened is placed at the top of the page, Dr. over the first money column at the right of the page and Cr. over the second money column. The two columns at the left are for the date of the transaction.

When an individual with whom an account is to be opened receives anything from the farm, the word To is placed before the description in the ledger and the price fixed for the article should be placed in the debtor column. When the farm receives anything from that individual the word By precedes the description and the price to be paid is entered in the credit column. In other words, anything going out is debited, anything coming in is credited.

The first item of entry in the cash account is the cash on hand which appeared in the inventory at the commencement of the accounts. This should be entered in the debit column and should be left out of all subsequent inventories as it appears in the cash balance in making up the balance sheet at the end of the year or whenever such a sheet is made out. All cash coming into the business is entered in the debit column of the cash account and all money paid out is entered in the credit column. If cash is looked upon as an individual to whom the farm transfers all money as soon as received and who pays out all moneys for the farm there will be no difficulty in keeping this account. It will be noticed that when cash is paid in by an individual with whom an account is kept the amount is credited in that individual's account and that the same amount is debited in the cash account. When money is paid to an individual with whom an account is kept the amount is debited in that individual's account and is credited in the cash account.

When money is paid to or received from an individual with whom no account is kept, the amount is credited or debited in the cash account as the case may be, and appears in no other account.

The disposal of the several cash items should be indicated in the memorandum book at the time the entry is made. When cash is received from or paid out to parties with whom no account is kept, it should be entered simply as cash received or paid. But when cash is received from or paid to parties with whom there is an account running, it should be entered in the memorandum book as cash paid or received.

The ledger account with James McIntire is the proprietor's account. He has been credited with his labor and debited with the amount of money he has withdrawn from the business.

C. H. Fuller is credited at the end of the month with his wages and is debited from time to time with the money paid him.

With these explanations and a careful study of memoranda and the following accounts there will be little difficulty in keeping the memoranda and posting the different items into the ledger.

	CASH.	DR.	CR.
1886.	Jan. 1, To amount on hand	$500 00	
	4, By paid for blacksmith work		$3 25
	6, " C. H. Fuller		5 00
	10, To rec'd from sale of beef cow	40 00	
	11, By cash paid James McIntire and wife		10 00
	18, By cash paid C. H. Fuller		11 00
	19, " " James McIntire and wife		8 50
	29, To amount from C. K. Mitchell & Co.	50 00	
	31, By balance		552 25
		$590 00	$590 00
	Feb. 1, To balance from last month	$552 25	

	C. K. MITCHELL & CO.	DR.	CR.
1886.	Jan. 1, To 50 lbs. butter at 35 cts	$17 50	
	8, " " " " "	17 50	
	15, " " " " "	17 50	
	22, " " " " "	17 50	
	29, By cash		$50 00
	29, To 50 lbs. butter at 33 cts	16 50	
	29, By groceries		8 50
	31, " balance		28 00
		$86 50	$86 50
	Feb. 1, To balance from last month	$28 00	

C. H. FULLER.

		Dr.	Cr.
1886.	Jan. 6, To cash	$ 5 00	
	18, " "	11 00	
	31, By labor for 1 month at $26.00		$26 00
	31, To balance	10 00	
		$26 00	$26 00
	Feb. 1, By balance from last month		$10 00

CHARLES DREW.

		Dr.	Cr.
1886.	Jan. 15, By 50 bu. corn meal at 70 cts.		$35 00
	29, " 1 ton cotton-seed meal		30 00
	29, To 100 bu. oats at 45 cts	$45 00	
	31, " balance	20 00	
		$65 00	$65 00
	Feb. 1, By balance from last month		$20 00

JAMES McINTIRE.

		Dr.	Cr.
1886.	Jan. 11, To cash	$10 00	
	19, " "	8 50	
	31, By labor for 1 month at $40.00		$40 00
	31, To balance	21 50	
		$40 00	$40 00
	Feb. 1, By balance		$21 50

In this example the accounts are closed at the end of the month. Ordinarily a farmer would have no occasion to close his accounts till the end of the year. This is done by finding the difference between the sums of the debit and credit sides of the accounts and placing it on the smaller side. Should the debit side be the smaller then it would be written, To balance, and the amount placed in the debit column. If the credit side be the smaller it should be written, By balance. The debit and credit side will now foot up the same. These balances must not be looked upon as actual entries. They indicate simply the amount necessary on that side of the account to make it balance. Most text-books recommend that these entries be made in red ink so that it may be seen at a glance that it is a false entry. Making the entry with lead pencil would serve the same purpose and would be more convenient for most farmers.

After closing the accounts and when it is desired to determine the gain or loss in the business at the end of the year, the next step is to take a new inventory of all the farm property, leaving out cash on hand as that is already represented in the cash account. Suppose that in the example given above this inventory foots up to $6525.00. The amount of this inventory is placed in the column headed assets in the balance sheet. Then all the balances that have been entered on the credit side of the ledger in closing the accounts are transferred to the assets column of the balance sheet, while those that have been entered on the debit side in closing the accounts are transferred to the liabilities column of the balance sheet. The footing of these two columns will give the total assets and total liabilities. The difference between the two footings will give the net assets. The difference between the net assets and the inventory taken at the commencement of the year will give the net gain or loss.

The balance sheet made out from the ledger example given above with an assumed inventory of $6525.00 would be as follows:

BALANCE SHEET.	Assets.	Liabilities.
Inventory	$6,525 00	
Cash	552 25	
C. K. Mitchell	28 00	
C. H. Fuller		$10 00
Charles Drew		20 00
James McIntire		21 00
	$7,105 25	$51 00

Net assets	$7,064 25
Net assets at beginning of year	7,033 00
Net gain	$21 00

In opening the accounts again for their continuation, the entries that were made in balancing the accounts should be brought down and entered in their true place, that is, those balances which are written To balance and entered in the debit column, are written in opening the account again, By balance from last month or year, as the case may be, and entered in the credit column. And those that appear on the credit side, written By balance in closing the account will be To balance from last month or year, and entered in the debit column.

For example, see the last item entered on each of the ledger accounts, which is the opening of the account again in each case.

Thus far all of the forms have been given that are necessary in running the general farm account in order to show whether the farm pays as a whole. If it be desired in addition to this to determine whether a certain department of the farm or a certain crop pays, the following ledger form shows how such an account may be kept. It will be better, however, for the beginner not to carry more than one or two such accounts at a time and carry them only so long as is required to determine whether the crop or department is profitable, and then start a special account with some other crop or department.

The account in this case is an actual account.

	BEAN FIELD, 5½ ACRES.	DR.	CR.
1882.			
Oct.,	To plowing 5½ acres at $2.50 (1 man, 1 pr. horses 5 days)	$13 75	
1883.			
June,	To harrowing, 1 man, 2 pr. horses 1½ days,	6 00	
	" " 1 man, 1 pr. horses 1 day...	2 75	
	" marking, 2 men, 1 horse, 1 day........	3 00	
	" 6 bu. yellow-eyed beans at $3.25	19 50	
	" planting, 2 men, 1 horse, 1½ day	5 25	
	" " 1 man ¼ day...............	30	
	" 2,750 lbs. phosphate...............	55 00	
	" cultivating, 2 men, 1 horse, ¾ day	2 65	
	" " " " ½ day	1 75	
	" hand-hoeing, 1 man, 3 days	3 75	
	" cultivating second time, 2 men, 1 horse, 1 day..........................	3 50	
	" setting stacking poles.......	1 40	
	" pulling beans, 31 hours at 10 cts.......	3 10	
	" " " 5¼ days at $1.40	7 35	
	" " " 1 day..	1 40	
	" " " 7¾ hours at 10 cts.......	78	
	" " " 2½ days at $1.40	3 50	
	" " " 1¼ day at $1.40..........	1 75	

	To drawing beans to barn................	$1 95	
	" threshing and winnowing, 7 days at $1.40,	9 80	
Nov.,	By $56\frac{1}{2}$ bu. beans at $3.10................		$175 15
	To balance...........................	26 92	
		$175 15	$175 15

LINCOLN COUNTY.

An Institute was called to meet at Whitefield, February 26, but owing to a severe storm it was indefinitely postponed.

WASHINGTON COUNTY.

Institute at Perry.

An Institute was held in the town of Perry, March 10, at which the Secretary of the Board was unable to be present. There were present of the members, Vice President B. A. Burr, Penobscot County; A. R. Lincoln, Washington; Francis Barnes, Aroostook; O. A. Pike, Oxford; J. E. Brainerd, Kennebec.

A second Institute for the county was held at Dennysville the day following, March 11. No report of these meetings is given.

OFFICERS,

Financial Statement and Statistics

OF

AGRICULTURAL SOCIETIES.

OFFICERS OF AGRICULTURAL SOCIETIES.

Societies.	President.	Post Office.	Secretary.	Post Office.	Treasurer.	Post Office.
State Agricultural	Rufus Prince........	So. Turner	A. L. Dennison	Portland	H. S. Osgood	Portland.
Eastern Me. Fair Association,	J. P. Bass...........	Bangor	Ezra L. Stevens	Bangor	E. B. Neally..........	Bangor.
Maine State Pomological.....	C. S. Pope	Manchester......	S. L. Boardman	Augusta	G. B. Sawyer	Wiscasset.
Androscoggin...............	Daniel Fields	Danville Junc ...	W. R. Wright	Lewiston.........	David Farrar	Lewiston.
Aroostook	J. F. Bither	Linneus	Ira J. Porter	Houlton	D. H. Porter	Houlton.
Aroostook, North............	G. M. Park	Presque Isle.....	H. H. Cook	Presque Isle.....	C. Hayford	Presque Isle.
Aroostook, Madawaska	Luc Albert..........	Madawaska	Alexis Cyr...........	Grand Isle	Jean Cyr	Madawaska.
Cumberland	W. W. Harris........	Cumb. Centre ...	J. J. Frye	Portland.........	L T. Chase.........	Portland.
Franklin County............	Silas Wilder.........	Temple	H. B. Cooledge.......	Farmington	P. P. Tufts...........	Farmington.
Franklin, North............	Seward Dill.........	Phillips	M. S. Kelley	Phillips	A. J. Wheeler.......	Phillips.
Franklin, Central	Adam Hunter........	Strong	E. J. Gilkey.........	Strong..	A. J. Norton.........	Strong.
Kennebec County............	J. R. Yeaton........	Mt. Vernon	H. O. Nickerson......	Readfield........	C. H. Stevens	Readfield.
Kennebec, North............	S. B. Abbott.........	Waterville	A. H. Rice	Waterville	J. G. Soule	Waterville.
Knox County	Eliot Weston.........	West Camden	Chas. L Allen........	Rockland	J. A. Tolman.........	Rockland.
Knox, North...............	C. R. Morton	Union	A. M. Wingate	Union	N. K. Burkett.......	Union.
Lincoln County	G. B. Sawyer........	Wiscasset........	R. C. Reed	Damariscotta....	Eph. Taylor	New Castle.
Oxford County	H. L. Horne........	Norway	A. C. T. King	South Paris	A. C. T. King	South Paris.
Oxford, West	A. O. Pike	Fryeburg	D. L. Lamson........	Fryeburg	John Locke	Fryeburg.
Penobscot County	J. E. Shaw..........	W. Hampden....	B. A. Burr..........	Bangor	B. A. Burr.........	Bangor.
Penobscot and Aroostook.. ..	J. W. Ambrose.......	Sherman Mills...	L. B. Rogers	Patten	S. W. Robbins	Patten.
Penobscot, West	S. W. S. Chase	Exeter Mills.....	T. P. Bachelder......	Kenduskeag.....	T. P. Bachelder......	Kenduskeag.
Penobscot, North............	Francis Crane	Lincoln	S. R. Ludden	Lee	Jos. Burland	Lincoln.
Penobscot, Central	J. M. Ames.........	East Corinth	Geo. H. Smith.......	East Corinth.....	Jas. Knowles	East Corinth.
Piscataquis, East	H. F. Daggett.......	Milo	M. L. Durgin, Jr.....	Milo	M. L. Durgin, Jr.....	Milo.
Piscataquis, Central.........	J. A. Philbrick......	Foxcroft	B. F. Hammond......	Foxcroft	B. F. Hammond......	Foxcroft.
Piscataquis, West	N. C. Strout.	Monson	J. F. Thombs.........	Monson	J. F. Thombs	Monson.
Sagadahoc	Franklin Reed.......	Bath...........	Z E. Mallett	Topsham	L. E. Smith	Brunswick.
Somerset, East	C. M. Jewett........	Palmyra	J. Finson	Hartland	G. M. Burleigh.......	Pittsfield.
Somerset, Central	R. B. Shepherd......	Skowhegan.......	A. R. Smiley	Skowhegan.......	A. R. Bixby.........	Skowhegan.
Somerset, West.............	Sam'l Bunker........		Benj. Moore.........	No. Anson	Benj. Moore	No. Anson.

Waldo County	S. A. Payson	Belfast	Mark A. Wadlin	Belfast	A. S. Redman	Belfast.
Waldo and Penobscot	F. Atwood	Monroe	E. H. Neally	Monroe	F. L. Palmer	Monroe.
Waldo, North	J. B. Vickery	Unity	J. H. Cook	Unity	H. B. Rice	Unity.
Washington County	Enoch Fisher	Charlotte	H. F. Porter	Pembroke	P. E. Vose	Dennysville.
Washington, West	J. L. Buckman	Columbia Falls	Eben F. Allen	Columbia Falls	F. L. Allen	Columbia Falls.
Washington, Central	J. C. Talbot	E. Machias	W. H. Phinney	Machias	M. Gardiner	Machias.
York County	D. A. Burnham	Kennebunkport	D. O. S. Hooper	Biddeford	Geo. F. Boothby	Saco.
York, Buxton and Hollis	J. M. Harper	E. Waterboro'	Ira W. Milliken	Hollis	Calvin Roberts	So. Hollis.
York, Shapleigh and Acton	E. A. Moulton	Shapleigh	H. Bodwell	Acton	H. A. Stanley	Shapleigh.
York, Ossipee Valley Ass'n	B. F. Pease	Cornish	J. C. Ayer	Cornish	H. Brackett	Cornish.

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1885.

	Amount Received from State.	Amount Raised by Society.	Total Receipts for the Year.	Total Amount of Premiums and Gratuities Awarded.	Incidental Expenses for the Year	Whole Amount of Disbursements for the Year.	Value of Property Belonging to the Society	Amount of Liabilities of the Society.	Awards for Plowing at Exhibition	For Bulls and Bull Calves.	For Working Oxen, 4 years old and over.	For Steers under 4 years old.	For Milk Cows.	For Heifers and Heifer Calves.
Maine State Pomological	$500	$508 56	$1008 96	$596 50										
Androscoggin	400	481 27	488 00	357 00	$120 00	$520 00	-	-	-	$17 00	$16 00	$20 00	$10 00	$21 00
Aroostook	95	103 35	198 62	120 90	15 02	135 92	-	$60 00	-	5 00	3 00	8 00	9 00	6 00
Aroostook, North	151	716 00	867 00	570 20	170 63	740 83	$677 00	529 50	-	18 25	16 00	19 50	25 00	12 75
Aroostook, Madawaska	67	48 89	115 89	95 00	40 00	135 00	-	-	-	3 25	3 00	6 25	2 25	3 75
Cumberland County														
Franklin County	114	1712 77	1712 77	653 35	285 09	1422 68	3000 00	450 00	$0 75	22 50	87 00	38 00	17 50	16 25
Franklin, North	55	710 46	791 46	315 00	174 84	622 04	1100 00	517 50	-	10 00	42 00	28 00	16 00	8 00
Franklin, Central	8	82 00	169 61	68 96	76 20	160 86	550 00	400 00	-	1 90	9 20	4 50	90	90
Kennebec County	309	1160 69	1469 69	696 85	907 38	1604 23	-	-	-	14 00	26 00	24 00	29 50	30 75
Kennebec, North	91	2100 68	2191 68	720 50	130 54	2266 14	3000 00	1500 00	-	18 00	8 00	21 00	26 00	22 00
Knox County	166	441 00	478 02	441 75	125 00	566 75	-	-	-	14 00	12 50	7 00	17 00	14 75
Knox, North	152	383 20	539 72	311 80	282 82	594 62	-	-	-	8 25	31 00	27 75	7 25	3 00
Lincoln County	248	630 06	878 06	284 00	204 27	839 68	-	-	-	7 00	6 00	5 00	14 00	2 50
Oxford County	228	2922 95	3150 95	1574 05	1664 72	3298 51	7500 00	1294 41	19 00	120 00	87 00	102 00	52 00	68 00
Oxford, West	55	1379 90	1434 90	929 70	439 72	1369 42	5200 00	2500 00	-	19 50	66 00	44 00	24 50	25 00
Penobscot County	71	100 00	90 00	64 25	29 50	93 75	-	-	-	11 00	-	-	4 50	2 25
Penobscot and Aroostook	100	166 00	226 00	116 00	54 36	170 36	-	-	-	5 75	4 50	9 25	9 00	2 25
Penobscot, West	189	663 97	1142 97	350 80	594 63	945 43	2000 00	-	-	13 50	17 00	21 00	23 00	15 25
Penobscot, North	62	118 49	-	93 00	25 00	118 49	-	30 00	-	2 75	5 00	6 00	4 50	5 00
Penobscot, Central	50	64 59	114 59	166 60	21 30	114 59	-	-	-	6 00	17 00	8 75	18 50	14 00
Piscataquis, East	16	53 50	69 50	64 80	21 75	86 55	-	-	-	2 00	7 50	9 25	2 50	2 50
Piscataquis, Central	133	393 75	526 75	344 25	154 00	498 26	-	-	-	13 00	34 00	7 50	17 00	7 50

Piscataquis, West...............	-	55 25	55 25	87 85	36 00	67 00	-	56 85	-	2 00	16 00	3 00	-	4 50
Sagadahoc	263	2322 00	2585 00	1570 20	1491 75	3061 95	5500 00	650 00	-	28 00	148 00	44 00	12 00	23 00
Somerset, East	115	674 40	789 40	715 85	198 00	790 40	2500 00	-	-	14 00	15 00	46 50	37 00	14 75
Somerset, Central..............	108	2842 00	3050 00	870 85	2399 20	3270 05	4000 00	220 00	-	45 00	62 00	15 00	46 00	65 00
Somerset, West.................														
Waldo County...................	130	579 00	709 00	737 50	50 00	787 50	3000 00	10 00	-	36 00	10 00	21 00	60 00	26 00
Waldo and Penobscot	130	1336 95	1466 95	1003 15	406 56	1409 71	2500 00	-	-	33 00	36 00	28 00	27 00	36 00
Waldo, North...................	92	472 45	564 45	442 40	105 25	547 65	-	-	-	27 50	15 00	18 25	12 00	12 50
Washington County.............	181	1109 19	1290 19	857 30	355 34	1212 64	1600 00	-	-	42 00	10 00	23 00	19 00	31 50
Washington, Central......... ...	-	1000 00	1021 14	925 55	338 19	1113 74	-	272 60	-	30 00	17 00	21 00	31 00	28 50
Washington, West..............	219	1030 85	1349 85	704 82	497 04	1201 86	25 00	-	-	21 00	19 00	27 00	20 00	23 50
York County	147	849 12	996 11	788 04	326 52	1114 56	-	233 00	16 00	13 00	52 00	13 00	29 50	12 00
York, Buxton and Hollis........	110	719 92	829 92	440 61	35 00	305 00	1000 00	150 00	-	6 00	35 00	4 00	8 00	6 00
York, Shapleigh and Acton......	40	276 82	316 82	288 75	16 50	305 25	5000 00	-	3 00	5 50	48 00	9 50	7 75	5 50
York, Ossipee Valley Association..	200	1207 80	1715 03	840 05	768 07	1608 12	3500 00	-	-	29 00	52 00	20 00	36 00	26 00

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1885—*Continued.*

	For Fat Cattle.	For Trials of Speed.	For Stallions.	For Breeding Mares.	For Other Horses and Colts.	For Swine.	For Sheep.	For Poultry.	Total Amount Awarded for Live Stock.	Total Amount Awarded for Horses, not purses.	Amount Awarded for Indian Corn.	For Wheat.	For Rye.	For Barley.	For Oats.	For Buckwheat.	For Beans.	Peas.	For Potatoes.	For Carrots.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological ..																				
Androscoggin	-	-	11 00	5 00	28 00	9 00	5 00	-	84 00	44 00	20 00	13 00	3 00	5 00	5 00	-	-	-	16 00	
Aroostook................	-	-	3 00	6 00	26 00	9 00	15 00	2 50	57 50	35 00	-	25	-	40	75	50	-	25	2 90	55
Aroostook, North.........	-	300 00	11 00	12 00	57 00	5 00	12 50	4 50	113 00	80 75	2 75	2 25	-	-	2 25	-	-	-	1 50	
Aroostook, Madawaska	-	3 00	3 00	3 00	14 25	2 25	6 50	-	27 25	23 25	1 20	1 20	-	1 20	1 20	1 20	1 20	1 20	1 20	1 20
Cumberland County.......																				
Franklin County..........	5 00	212 00	27 00	3 00	24 00	4 00	25 00	4 00	199 25	27 00	1 35	-	-	-	1 00	-	-	-	35	55
Franklin, North..........	5 00	95 00	3 00	4 50	20 95	3 25	6 50	9 75	128 00	28 45	6 30	4 75	-	1 00	-	-	1 50	-	2 70	45
Franklin, Central.........	75	15 00	1 50	1 75	8 25	1 00	3 00	-	18 05	10 00	50	2 00	-	-	-	-	-	-	45	
Kennebec County.........	7 50	163 00	16 00	6 00	55 00	7 00	17 50	11 75	168 00	118 00	16 00	4 00	-	3 00						
Kennebec, North	8 00	340 00	18 00	6 00	92 00	3 00	11 00	6 00	123 00	121 00										
Knox County.............	4 50	-	11 00	-	16 00	13 00	7 00	19 00	108 75	42 00	4 50	2 00	1 00	1 00	1 00	-	6 00	1 50	8 50	
Knox, North.............	5 00	-	-	3 00	30 50	-	13 50	3 50	113 25	33 50	6 50	5 50	-	2 00	2 00	-	75	50	4 25	75
Lincoln County...........	6 50	118 00	28 00	5 00	17 00	6 50	6 50	3 25	54 00	50 00	7 75	6 50	-	2 00	-	-	1 50	50	2 50	50
Oxford County............	17 00	478 75	25 00	10 00	34 00	21 00	47 00	14 00	560 00	69 00	30 50	25 25	4 00	4 00	6 00	-	7 00	-	17 50	75
Oxford, West.............	4 00	392 50	9 00	6 00	26 50	12 00	10 75	7 00	212 25	41 50	11 75	-	-	-	2 00	-	2 00	-	2 50	50
Penobscot County........		-	8 00	-	-	3 00	3 00	5 00	-	-	2 50	75	75	50	75	-	1 25	1 25	2 25	50
Penobscot and Aroostook ..	3 00	8 00	5 00	2 00	8 50	6 00	11 00	50	50 75	15 50	50	-	-	-	-	-	-	-	50	
Penobscot, West..........	5 00	-	20 50	6 00	32 50	8 00	16 00	7 50	118 75	59 00	16 65	-	-	1 75	2 25	1 00	2 25	1 75	3 20	
Penobscot, North.........	-	2 50	-	2 50	13 00	-	5 00	1 00	29 25	18 00	1 00	-	-	-	-	-	-	-	25	25
Penobscot, Central........	-	-	6 00	5 50	27 75	-	7 00	1 75	75 50	39 25	3 90	2 50	-	-	-	25	25	-	25	
Piscataquis, East..	-	5 00	3 00	3 00	3 50	-	4 50	1 00	28 25	9 50	75	75	-	-	75	-	75	75	75	

Piscataquis, Central.......	-	130 00	10 00	12 00	45 50	11 00	5 00	4 00	94 50	67 00	75	-	-	-	-	-	-	-	25	25
Piscataquis, West	-	-	4 90	3 00	14 00	-	1 00	1 00	26 50	21 50										
Sagadahoc	11 00	576 00	41 00	8 00	50 00	18 00	25 00	29 00	368 50	70 00	7 25	1 00	1 00	2 25	2 50	1 75	5 00	1 50	10 50	50
Somerset, East............	8 50	450 00	-	5 75	23 75	8 50	15 50	-	159 75	29 50	-	8 00	-	-	-	-	-	-	1 25	
Somerset, Central.........	-	400 00	30 50	12 00	49 50	13 00	19 50	11 00	276 50	92 00	2 50	-	-	-	1 25	-	1 25	-	3 00	50
Somerset, West...........																				
Waldo County............	5 00	370 00	20 00	15 00	30 00	10 00	15 00	10 00	193 00	65 00	5 00	3 00	-	-	5 00	-	3 00	-	6 00	
Waldo and Penobscot......	10 00	449 00	32 00	7 00	51 00	6 00	28 00	22 00	226 00	90 00	7 50	3 50	-	1 00	1 50	-	1 50	-	5 25	1 50
Waldo, North	9 00	174 00	16 00	6 00	21 75	-	14 75	3 80	150 55	43 75	6 00	6 00	2 50	-	1 75	-	3 50	-	6 00	1 25
Washington County	5 00	303 00	16 00	21 00	36 00	14 00	14 00	22 50	209 00	73 00	3 25	2 25	-	3 50	3 00	3 50	13 25	5 25	14 50	2 75
Washington, Central......	-	473 00	35 00	13 00	27 00	24 00	16 00	23 00	290 50	75 00	1 25	13 00	-	1 00	1 50	-	5 75	3 00	25 00	1 75
Washington, West	-	216 00	25 00	11 00	26 00	19 00	28 00	11 50	164 00	62 00	2 75	14 00	-	5 00	5 00	-	5 00	5 00	10 75	3 75
York County..............	6 00	340 00	7 00	6 00	25 00	8 00	-	25 00	177 50	38 00	-	-	-	-	50	-	1 50	-	1 50	25
York, Buxton and Hollis..	2 00	135 00	-	3 00	3 00	3 00	-	1 50	65 50	6 00	3 00	-	-	-	-	-	2 00	-	50	
York, Shapleigh and Acton	6 00	125 00	2 00	2 00	22 50	7 50	7 00	5 25	128 00	147 50	5 00	1 75	2 50	2 25	2 50	-	7 50	2 50	1 50	1 50
York, Ossipee Valley Ass'n.	3 00	382 00	14 00	7 00	17 00	8 00	24 00	6 00	253 00	56 00	6 00	5 00	-	-	2 00	-	-	-	3 00	

Financial Statement of Agricultural Societies for the Year 1885—*Concluded*.

	For Beets.	For Onions.	For Turnips.	For Cabbage.	Total am't awarded for Grain and Root Crops.	For any Other Cultivated Crops.	For Fruits and Flowers.	For Honey, Sugar and Syrup.	For Bread, Butter and Cheese.	Agricultural Implements.	Household Manufactures and Needle-Work.	Manufactures of Wood, Iron and Leather.	Other Mechanical Products.	All Objects not Enumerated Above.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Maine State Pomological	-	-	..	-	-	-	596 50							
Androscoggin..........	-	-	-	-	62 00	40 00	12 00	-	28 00	-	49 00	-	-	35 00
Aroostook	40	25	65	40	7 30	1 05	75	-	1 00	3 00	15 30	-	-	-
Aroostook, North			1 75		10 50	-	18 25	6 00	9 75	-	4 45	-	-	27 00
Aroostook, Madawaska..	1 20	2 40	1 20	1 20	16 80	-	-	1 20	1 20	3 45	18 75	-	3 60	-
Cumberland County.....														
Franklin County	55	35	-	35	4 50	-	21 55	2 90	7 50	2 35	22 15	5 75	2 00	2 50
Franklin, North........	45	40	45	-	18 00	-	9 30	1 90	4 50	-	27 50	1 00	-	1 35
Franklin, Central.......	75	25	25	25	4 15	85	4 10	3 50	1 85	-	14 85	-	-	1 10
Kennebec County.......	3 00	-	-	-	42 00	17 00	46 00	2 50	39 00	5 00	60 00	-	-	77 35
Kennebec, North.......	-	-	-	-	-	-	32 00	2 00	12 00	-	5 50	-	-	-
Knox County...........	4 50	4 50	2 50	3 50	40 50	20 50	6 25	8 50	18 00	-	28 75	-	-	65 00
Knox, North	3 00	1 50	1 25	1 50	29 50	5 00	27 15	1 75	14 50	75	50 25	1 50	-	41 65
Lincoln County	1 50	1 50	1 00	1 25	22 25	4 25	35 00	-	3 75	4 50	29 80	3 00	-	51 20
Oxford County.........	3 75	75	75	75	94 00	24 00	43 75	7 80	38 00	21 00	50 65	47 15	2 80	134 40
Oxford, West	50	50	50	50	22 25	5 00	21 00	19 50	19 50	8 00	49 45	8 00	-	61 00
Penobscot County.......	2 00	75	1 75	75	-	-	12 25	1 25	7 00	-	7 50			
Penobscot and Aroostook	50	25	25	50	3 00	-	7 50	1 75	4 00	-	21 75	-	3 75	-
Penobscot, West	2 00	1 00	1 00	1 70	-	2 25	25 50	7 55	18 00	-	53 70	-	2 00	2 00
Penobscot, North	50	25	-	25	2 50	-	5 50	2 75	10 00	-	20 00	2 00	-	3 00
Penobscot, Central	25	-	25	25	2 90	-	8 00	50	4 75	-	12 45	1 00	-	7 25

	Number of Bulls and Bull Calves.	Number of Cows.	Number of Heifers.	Number Heifer Calves.	Number Working Oxen (pairs)	Number Pairs Steers.	Number Fat Cattle.	Total Number of Cattle.	Number Horses, Colts.	Number Sheep.	Number Swine.	Number Poultry.
Maine State Pomological												
Androscoggin..........	17	10	19	2	8	10	-	80	43	15	55	
Aroostook	4	13	5	2	5	11	-	56	54	59	25	24
Aroostook, North	17	36	17	16	14	23	-	185	91	47	17	30
Aroostook, Madawaska..	8	6	10	4	6	8	-	56	45	16	3	
Cumberland County.....												
Franklin County	16	21	24	19	88	112	10	290	104	90	13	52
Franklin, North........	9	60	21	6	64	40	7	311	62	48	16	57
Franklin, Central.......	6	10	17	6	18	9	8	75	20	21	8	
Kennebec County.......	24	51	42	27	30	52	30	500	131	45	40	*40
Kennebec, North.......	12	24	17	8	8	15	10	-	60	35	26	
Knox County...........	6	17	16	6	13	6	4	68	27	20	28	106
Knox, North	7	10	6	-	30	14	6	114	46	42	-	27
Lincoln County	4	22	4	1	10	8	5	86	37	12	20	50
Oxford County.........	31	27	40	13	55	58	13	422	43	165	39	95
Oxford, West	12	18	14	6	19	31	1	101	48	32	21	25
Penobscot County.......												
Penobscot and Aroostook	8	13	8	1	2	18	-	68	25	35	5	6
Penobscot, West	11	19	14	6	15	18	6	89	103	47	15	84
Penobscot, North	4	15	15	4	4	6	-	58	29	15	-	30
Penobscot, Central	3	10	7	-	11	8	2	52	25	14	-	15

*Coops.

Piscataquis, East	75	-	75	75	6 75	-	1 50	-	2 50	-	3 00	-	-	7 30	2	3	4	2	6	8	-	39	27	9	-	6
Piscataquis, Central	25	25	25	25	2 00	-	12 25	3 50	11 75	-	12 75	2 00	-	-	10	22	11	-	13	8	-	63	56	12	33	30
Piscataquis, West	-	-	-	-	8 60	-	2 50	1 00	7 25	1 00	2 60	4 00	-	13 10	5	12	7	2	4	10	-	60	30	25	-	20
Sagadahoc..............	1 50	4 50	2 50	75	42 50	78 50	54 00	14 75	28 00	4 00	46 54	26 75	-	20 00	9	30	35	5	30	25	3	300	35	60	20	
Somerset, East	2 00	75	-	-	-	-	4 80	-	16 25	-	23 00	-	-	20 55	8	45	25	15	19	21	11	187	75	60	41	
Somerset, Central	75	1 75	75	1 00	12 75	5 50	24 85	2 25	9 00	-	27 00	9 00	9 00	3 00	22	35	37	20	46	16	-	238	95	47	37	54
Somerset, West																										
Waldo County..........	2 00	3 00	2 00	5 00	34 00	-	-	-	6 00	-	9 00	-	-	60 00	17	25	30	10	6	17	2	107	35	30	7	12
Waldo and Penobscot...	3 00	1 50	1 75	1 50	30 95	6 50	24 50	1 50	6 75	-	131 50	-	-	36 40	20	21	23	10	20	18	14	185	75	80	8	300
Waldo, North..........	1 25	1 25	1 25	1 25	32 00	2 00	10 75	3 50	5 00	-	19 90	-	-	7 95	15	18	12	6	45	25	10	131	50	25	-	40
Washington County	2 25	5 00	2 50	2 50	71 75	20 50	41 15	5 25	15 75	1 50	78 85	19 00	-	18 55	19	40	27	6	6	15	6	140	34	30	38	125
Washington, Central ...	3 50	3 50	1 75	1 50	62 50	8 50	28 00	2 75	10 00	-	53 30	13 00	9 00	-	8	19	21	9	4	23	-	84	47	12	35	143
Washington, West......	6 00	3 75	3 75	1 00	67 25	5 00	13 70	4 00	15 00	1 00	42 73	15 25	-	98 89	5	21	14	5	9	28	-	32	25	26	13	54
York County...........	-	1 00	1 00	1 00	16 75	-	5 75	4 50	6 00	-	108 44	-	-	56 60	13	15	12	2	73	10	4	212	32	-	5	72
York, Buxton and Hollis	-	25	-	50	6 25	-	-	50	3 00	-	32 00	-	-	15 11	7	13	12	8	55	21	1	194	18	-	28	22
York, Shapleigh & Acton	3 00	1 50	3 00	1 50	36 00	-	12 00	3 75	6 00	1 50	25 75	-	-	59 25	7	12	13	2	40	18	10	150	30	26	6	60
York, Ossipee Valley As'n	1 50	-	-	1 50	19 00	-	9 00	-	6 00	-	70 00	-	-	42 00	43	48	30	16	81	61	26	447	138	41	8	31

ANNUAL REPORT

OF

THE MAINE FERTILIZER CONTROL

AND

Agricultural Experiment Station.

1885-6.

THE MAINE FERTILIZER CONTROL

AND

AGRICULTURAL EXPERIMENT STATION.

BOARD OF MANAGERS.

EX-OFFICIO.

PROF. WALTER BALENTINE, Orono,
Professor of Agriculture in the Maine State College.

HON. Z. A. GILBERT, North Greene,
Secretary Maine Board of Agriculture.

APPOINTED BY THE GOVERNOR.

HON. S. L. BOARDMAN, Augusta.
WILLIAM DOWNS, ESQ., Sebec.
BENJAMIN F. PEASE, ESQ., Cornish.

Officers of the Board.

HON. Z. A. GILBERT, President.
HON. S. L. BOARDMAN, Secretary.
WILLIAM DOWNS, ESQ., Treasurer.

Station Officers.

WHITMAN H. JORDAN, Orono, *Director.*
JAMES M. BARTLETT, Orono, *First Assistant.*
L. H. MERRILL, Orono, *Second Assistant.*
GILBERT M. GOWELL, Orono,
Supt. Field and Feeding Experiments.

To the Honorable Governor and Council of Maine.

The Board of Managers of the Maine Fertilizer Control and Agricultural Experiment Station herewith submit to you, in accordance with the law, the Annual Report of the Station, for the year ending July 1st, 1886.

Z. A. GILBERT, *President.*

SAMUEL L. BOARDMAN, *Secretary.*

REPORT OF THE TREASURER.

William Downs, in account with the Maine Fertilizer Control and Agricultural Experiment Station,

For the Year Ending December 31, 1885.

RECEIPTS.

From State Treasurer	$4604 90	
License Fees	790 00	
Analysis Fees	36 00	$5430 90

EXPENDITURES.

Salaries	$1880 83	$1880 83
Chemical Laboratory, Apparatus, &c	1285 97	1285 97
FIELD AND FEEDING EXPERIMENTS.		
Four Steers	131 50	
Dairy Apparatus	50 30	
Platform Scales	35 00	
Fodder Cutter	35 00	
Silo, Ensilage, Plots, &c	250 12	501 92
CONSTRUCTION.		
Water Supply	150 00	
Stable	78 67	
Chemical Laboratory	317 45	546 12

GENERAL EXPENSE.

Office Furniture..............	81 58	
Rent	30 00	
Sampling Fertilizers..........	37 82	
Postage	11 10	
Interest	9 77	
Wood and Coal..............	12 99	
Miscellaneous................	53 81	237 07
Travelling Expenses of Board..............		153 03
Cash Paid into State Treasury		790 00
		$5394 94
Balance in Treasury........		35 96

WILLIAM DOWNS,
Treasurer.

REPORT OF DIRECTOR.

To the Board of Managers of the Maine Fertilizer Control and Agricultural Experiment Station.

GENTLEMEN:—I herewith submit a report of the work of the Station for the year beginning July 1, 1885, and ending June 30, 1886.

A statement of the work performed by the Station up to June 30, 1885, in collecting and analyzing samples of fertilizers, was printed in the last report of the Maine Board of Agriculture. With this exception, the present report includes all that has been accomplished since the organization of the Station.

During the fifteen months that have elapsed since the Station officers first entered upon their duties, considerable time and money have been devoted to preparation for the various lines of work to be followed.

A chemical laboratory of good working capacity has been partitioned off from the main College Laboratory, and supplied with apparatus.

The expense and labor involved in this have been considerably augmented by the requirements of the fertilizer inspection, as the rapid execution of the analyses of fertilizer samples demands a much more expensive equipment than would otherwise be needed.

Part of the dairy-room of the College Farm has been fitted up with apparatus convenient for use in experiments involving the handling of milk. Platform scales and smaller scales have been purchased with which to make the necessary weighings in feeding experiments. It is expected that a portion of the barn now being erected by the college will be placed under the control of the Station, and the larger part of the lumber necessary for the fitting up of stalls, etc., has been purchased.

Nearly an acre of good garden soil has been put under cultivation in testing varieties, methods of planting, etc., and over two acres of land have been laid out in plots, which are now occupied with fertilizer experiments.

Thirty-six boxes, without bottoms, having an area of nine square feet with a depth of eighteen inches, have been set in the ground and filled with soil made as nearly uniform as possible, the object being to make experiments in plant growth and avoid the necessary errors of field experimentation.

The following is a summary of the work already accomplished by the Station in the way of analysis and investigation, excepting the analysis of forty-eight samples of fertilizers in 1885:

The collection and analysis of fifty-six (56) samples of fertilizers (1886), and nineteen (19) samples of ashes.

Digestion experiments with hays, whole corn, corn-meal and corn-and-cob meal, requiring the analysis of nine (9) samples of cattle foods, the feeding of accurately weighed quantities of food for about seventy days in all, the collection of the solid excrement for twenty-nine days, and the analysis of six (6) samples of solid excrement.

Comparison of the composition of the manure residues of certain cattle foods with the composition of the foods themselves, involving the collection of the solid excrement and urine for fourteen days, and the estimation of the important manurial ingredients in five samples of food and four samples of solid excrement and urine.

Experiment in feeding for milk production, requiring the feeding of two hundred and fifty-two carefully weighed rations, the partial analysis of two hundred and seven (207) samples of milk, eighteen (18) samples of butter-milk and eighteen (18) samples of butter, besides taking the weights and percentages of cream of two hundred and fifty-two (252) messes of milk, and making the butter from twenty-seven (27) lots of cream.

Experiment in feeding steers for winter growth, continued for one hundred and thirty-two (132) days, during which time five hundred and twenty-eight rations were weighed out. Analysis of samples of hay from eight species of grass, clover, and weeds. Miscellaneous analyses, including condimental foods, and various materials sent to the Station by farmers and others.

The chemical part of the work accomplished by the Station during the year has involved, as one feature of it only, at least three thousand weighings on a very delicate balance, this being only a fraction of the necessary chemical labor. The above partial enumeration of the details of the analyses and other operations, that have been necessary in order to secure the results given in this report, is made in order to show the real magnitude of the work that experiment stations are expected to undertake.

In regard to the value of what has so far been accomplished by the Station, it is but proper to state that the data obtained from the experiments that have been conducted are given only as a report of progress. It seems very probable that further investigation will corroborate the results of the digestion and feeding experiments. Without doubt the inspection of fertilizers has been of considerable benefit already. The figures obtained from this inspection, as given in this report, show very plainly that a small number of brands of fertilizers now offered for sale in the State are unworthy the attention of farmers at the prices asked, and it is also made clear that farmers can have confidence in the large majority of brands which are found in the market.

As an example of the beneficial action of the system of fertilizer control now in force in this State, it may be mentioned that in one instance the Station analysis of a sample of a well known fertilizer showed that the lot of goods from which it was taken was much inferior to the standard which this fertilizer had previously maintained. A representative of the company making the fertilizer, upon investigation finding that the Station analysis undoubtedly represented the lot of goods sampled, promptly withdrew it from the market, an action not only highly creditable in itself, but also directly beneficial to the farming community in which the goods in question were sold.

In presenting this report I desire to acknowledge the hearty and efficient co-operation of those who are associated with me in carrying on the work for which the Station is designed. The results discussed in the following pages are the product of the united hand-work and brain-work of the Station officers.

The college authorities, of whom the State asked a place in which to locate the Station, have freely given space in their already over-crowded buildings for a laboratory and office, and have in every possible way aided in advancing the interests of the Station.

Special acknowledgment should be made to Messrs. Hauck and Comstock of Mechanicsburg, Pa., for the present of a No. 2 Lion Feed Cutter, and to Messrs. Hiram Sibley & Co., of Rochester, N. Y., for samples of potatoes, barley and oats.

W. H. JORDAN, *Director.*

INSPECTION OF FERTILIZERS.

The inspection of the various brands of fertilizers sold in the State has for its object (1) the comparison of the actual composition of these brands with the guaranteed composition, this being required by law, and (2) the determination of their relative values. In carrying out this inspection the fertilizers must be sampled in the hands of dealers or consumers, analyzed, and their values are then calculated on the basis of ruling commercial prices.

Since the station was organized in March, 1885, one hundred and four samples of fertilizers have been examined, representing thirty-two brands.

The results of the inspection for 1885 have already been published, and only the analyses made during the present year (1886) appear in this report. There is given below the analyses of fifty-six samples, taken from twenty-nine brands, with such preceding explanations as are deemed necessary for a clear understanding of the main facts pertaining to the composition of commercial fertilizers, and of the real significance that the analyses and valuations have for the consumer.

VALUABLE INGREDIENTS OF FERTILIZERS. The ingredients of commercial fertilizers upon which both their agricultural and commercial values chiefly depend are nitrogen, phosphoric acid and potash. Besides these more valuable ingredients, sulphuric acid and lime are always present in superphosphates in considerable quantities, being a necessary accompaniment of phosphoric acid as it exists in nearly all manufactured fertilizers.

Nitrogen is the most costly of the three important ingredients mentioned, and adds largely to the commercial value of all the fertilizers sold in Maine, with one or two exceptions. It is found in the markets in quite a variety of substances which are used to supply this ingredient to mixed fertilizers, but which are available for fertilizing purposes when purchased unmixed with anything else. The following materials furnish organic nitrogen to fertilizers:

Dried blood, dried and ground fish, azotin and ammonite (prepared animal matter), fish scrap, meat scrap, cotton-seed meal, castor pomace, horn, hair, wool, leather waste, etc. These substances must decompose and the nitrogen become changed into compounds of nitric acid and ammonia before it is available to plants. There is, therefore, a great difference in the value of organic nitrogen as found in the above-named materials. Dried blood, for instance, decomposes in the soil rapidly, while horn, hair, wool and leather scrap decay very slowly, and the nitrogen which they contain becomes useful only after a long period of time. These latter substances are not only less useful to the farmer than blood, fish and meat, but they are also much less costly, and their presence in a fertilizer supposed to be manufactured of the best materials is good evidence of fraud.

The phosphoric acid of superphosphates is determined in three forms, according to its solubility in various liquids, viz: *soluble*, *reverted*, and *insoluble*.

Soluble phosphoric acid is that which exists in fertilizers in a form freely soluble in water. It is obtained by treating certain phosphatic materials, such as bone and South Carolina rock, with sulphuric acid (oil of vitriol).

In the chemical changes caused by the sulphuric acid, hydrated calcium sulphate (gypsum) is formed if sufficient water be present, which is the same compound as land plaster. The advantage of having the phosphoric acid of fertilizers rendered soluble is not that it remains so in the soil, for it becomes insoluble in water very shortly after application, but in the fact that when the compounds of the soil change it back to insoluble forms it becomes deposited in particles so minute that they are easily appropriated by the roots of plants.

Reverted phosphoric acid is a term originally signifying phosphoric acid that had once been "soluble," but which from some cause had "reverted" or "gone back" to forms insoluble in water. Now it is used to designate that which is dissolved by a solution of ammonium citrate, and includes not only the truly reverted, but also more or less of phosphoric acid as combined in the original, undissolved phosphatic material. Reverted phosphoric acid, in so far as it comes within the strict meaning of the term, most probably has a value for crop production equal to that of the soluble form, but it is not clear that this holds true of that which would be dissolved by ammonium citrate from finely ground South Carolina rock, for instance.

Insoluble phosphoric acid is that which is readily soluble neither in water nor in a solution of ammonium citrate, but which can be dissolved in strong acids. It comes from some of the original phosphatic material that has not been acted upon by sulphuric acid, and depends mostly for its value upon the kind of material used, whether bone or rock phosphate. In any case it has less value than the soluble or reverted forms.

It should be remembered that the terms "soluble," "reverted," and "insoluble" are merely relative in their significance. There is no compound of phosphoric acid that is not dissolved to a slight extent, at least, by pure water, and to a still greater degree by ammonium citrate, and the extent of the solubility of raw phosphates in these liquids, and in weak acids such as are found in the roots of plants, depends very largely upon their mechanical condition, or the degree of fineness to which they are ground.

The *potash* used in this country for agricultural purposes comes mostly from Germany in the so-called "German potash salts," which include potassium sulphate, potassium chloride (the muriate) and kainite. Except for a few special purposes, potash is equally valuable in all these forms, but costs least in the muriate and in kainite.

The Valuation of Fertilizers.

The law establishing the Station requires that the average of three analyses of each brand of fertilizer sold in the State, with certain exceptions, shall be compared with the guaranteed composition of the fertilizers examined.

This Station, in common with all American experiment stations that stand in an official relation to the fertilizer trade, goes farther than this and applies a schedule of trade values to the goods that it inspects. By means of these trade values there is calculated for each brand what has been designated as the "estimated value" or the "station valuation." As these estimated values are not intended to represent the proper selling price of mixed goods at the point of consumption, and in order to prevent any possible misapprehension as to their real meaning, the following explanations are offered:

1. These trade values represent very closely the prices at which a pound of nitrogen, phosphoric acid and potash, in their various forms, can now be purchased for cash at retail in our large markets. They are based mostly upon the ton prices at which certain classes of goods are offered to actual consumers, and correspond also to "the average wholesale prices for the six months ending March 1st, plus about twenty per cent in the case of those goods for which we have wholesale quotations."

2. These trade values do not include the charges for transportation from the market to the consumer, for storage, mixing, commissions to agents and dealers, selling on long credit, bad debts, etc., etc.

3. They are the prices of nitrogen, phosphoric acid and potash, *ready for use by the farmer*, when these ingredients are purchased under the above-named conditions, singly and not mixed. In ordinary superphosphates we find these three ingredients mixed, but this is not a necessary condition of their use.

An illustration may serve to make clear the above statements. A farmer wishes a ton of fertilizer similar to the well known brands sold in this State. If he purchases for cash in New York or Boston sixteen hundred (1,600) pounds of dissolved bone black, three hundred (300) pounds of sulphate of ammonia, and one hundred (100) pounds of muriate of potash, and mixes these ingredients together, he will have a complete fertilizer not essentially different from many standard brands of ammoniated superphosphates. The cost of the ton after mixing (if the farmer prefers to mix the ingredients) will be made up as follows:

a. Cost of the materials in the markets.

b. Cost of transportation.

c. Cost of mixing.

The first element entering into the total cost is the only one included in the "estimated value." If there is added to this one element, not only the charges for transportation and mixing, but also the expenses of selling through agents and dealers, long credits, bad debts, etc., we have the factors involved in the cost of our ordinary superphosphates when delivered at or near the place of consumption. As is to be expected, the station valuations of superphosphates fall below their selling prices. Last year the average difference in this State was $9.00 per ton.

This year it is $9.96, excluding certain brands for which there is evidently a serious overcharge.

4. The Station valuations stand in no direct or necessary relation to the comparative profits which may be derived from the use of the various fertilizers by individual farmers. These values have an almost purely commercial significance, and are not designed to point out to a farmer whether he shall use potash, which is a comparatively cheap ingredient, or nitrogen, which is comparatively costly. If ordinary superphosphates are compared, however, on the basis of

commercial valuations it will be found to be true in general that their fertilizing power is in proportion to the money value.

The following schedule of trade values used in this State for 1886 is the one agreed upon by the experiment stations of Massachusetts, Connecticut and New Jersey, after a careful study of prices ruling in the large markets of New England and the Middle States.

There is scarcely any trade in raw materials and chemicals in Maine from which to obtain data for the determination of such values, but quotations made to Maine farmers by Boston and New York dealers are in accord with the prices given below. For comparison, the trade values used in 1885 are also given:

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS FOR 1886.

	1885 Cts. per lb.	1886 Cts. per lb.
Nitrogen in ammonia salts	18	18.5
" in nitrates	18	18.5
Organic nitrogen in dried and fine ground fish	18	17
Organic nitrogen in guanos, dried and fine ground blood and meat	18	17
Organic nitrogen in cotton seed, linseed meal and in castor pomace	18	17
Organic nitrogen in fine ground bone	18	17
" " in fine medium bone	16	15
" " in medium bone	14	13
" " in coarse med. bone	12	11
" " in coarse bone, horn shavings, hair and fish scrap	10	9
Phosphoric acid. soluble in water	9	8
" " soluble in ammonium citrate (commonly called "reverted")	8	7½
Phosphoric acid, insoluble in dry fine ground fish and in fine bone	6	7
Phosphoric acid, insoluble in fine medium bone	5½	6
" " insoluble in medium bone	5	5
" " insoluble in coarse bone	4	3
" " insoluble in coarse medium bone	4½	4
" " insoluble in fine ground rock phosphate	2	2
Potash as high grade sulphate	7¼	5½
" kainite	4¼	4¼
" muriate	4¼	4¼

These values are applied to the valuation of superphosphates and all mixed goods, as follows:

It is assumed that the organic nitrogen of these goods has for its source such materials as dried blood, ground fish, or nitrogenous substances of equally good quality, unless a special examination of some particular brand shows that inferior material like leather has been used. Organic nitrogen in mixed goods will therefore be valued at seventeen cents per pound.

The insoluble phosphoric acid of mixed fertilizers is considered as coming entirely from bone, and not from South Carolina rock, and is reckoned at three cents per pound.

The potash is valued at the price of that ingredient in kainite and the muriate, unless the chlorine present in the fertilizer is not sufficient to combine with it, in which case the excess of potash is reckoned as the sulphate.

The valuation of a fertilizer is obtained by multiplying the percentages of the several ingredients by twenty (which gives the pounds per ton), and these products by the prices per pound, and the sum of the several final products is the market value of the fertilizing ingredients in one ton.

These estimated values should be studied in the light of the previous explanations. It will probably rarely happen in this State that a mixed fertilizer can be sold near the point of consumption as low as the Station valuation, the excess of cost representing certain expenses previously enumerated. The Station valuations give the consumers a fairly accurate basis for estimating the relative cost of plant food in the various brands of fertilizers, and will help the farmer to determine whether he can in any way profitably change his methods of buying fertilizing ingredients. A caution should be uttered, however, against making too close an application of the Station valuations, as a difference of a few cents, or even of a dollar, on a ton between two brands may have no real significance, but may be due to unavoidable errors of sampling and analysis, that render it impossible to determine to the utmost exactness the composition of the entire bulk of material that is sold.

All the samples analyzed in 1886 have been selected by Station officers. Three samples have not been secured of every brand so far this year, as required by law, in some cases because it has been difficult to find the fertilizers on sale in three places, in other instances because the fertilizers are not sold very much through agents and so are found largely distributed only in the hands of consumers, and partly because of lack of time before issuing this report.

The tables which immediately follow give on the left-hand pages the history of the samples taken, and on the opposite right-hand pages the results of the analyses. The selling prices given represent in most instances the rate at which single packages, and not ton lots, are sold. The comparative money values, as calculated by the Station in the manner previously explained, have much more significance than the excess of selling price over valuation, because the selling price varies in some instances according to the quantity of fertilizer sold, conditions of payment, location, &c.

There is one point in connection with the excess of selling price, however, to which attention should be called, which is that the same excess of selling price over valuation in two cases does not necessarily mean that one fertilizer is sold as cheaply as the other. This can be illustrated as follows: A's fertilizer is sold for forty dollars per ton, and values at thirty-two dollars. B's fertilizer sells for twenty-four dollars per ton, and has a valuation of sixteen dollars. The excess of selling price is eight dollars in both cases, but this is only twenty-five per cent of the money value of the ingredients in A's fertilizer, while it is fifty per cent of a similar valuation of B's fertilizer. In other words, B is charging the farmers twice as much as A for handling a given quantity of plant food.

The figures which show the composition of the various fertilizers analyzed represent the pounds of ingredients found in one hundred pounds of the fertilizer.

Station Number	BRAND.	MANUFACTURER.	SAMPLED AT	Station Number.
160	Acme Superphosphate	Atlantic Fertilizer Co., Boston, Mass.	Portland	160
170	Americus Ammoniated Bone Superphosphate	Williams, Clark & Co., New York, N. Y.	Benton	170
115	Bay State Fertilizer	Clark's Cove Guano Co., New Bedford, Mass	Bangor	115
123	" " "	" " " "	Portland	123
153	" " "	" " " "	New Gloucester	153
121	Bay State Superphosphate	J. A. Tucker & Co., Boston, Mass.	Corinna	121
131	" " "	" " "	Augusta	131
117	Bowker's Hill and Drill Phosphate	Bowker Fertilizer Co., Boston, Mass.	Dexter	117
130	" " " "	" " " " "	Brunswick	130
156	" " " "	" " " " "	Cumberland Center	156
163	Bowker's Ammoniated Dissolved Bone	Bowker Fertilizer Co., Boston, Mass	Auburn	163

Station Number	BRAND.	Moisture.	Nitrogen. Of Nitrates.	Of Ammonia Salts.	Of Organic Matter.	Total. Found.	Total. Guaranteed.	Phosphoric Acid. Soluble.	Reverted.	Insoluble.	Total Found.	Total Guaranteed.	Available. Found.	Available. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Station Valuation of One Ton.	Selling Price of One Ton.	Selling Price Exceeds Station Valuation.	Station Number
160	Acme Superphosphate....................	16.72	....	.54	2.05	2.59	....	9.82	.34	1.90	12.06	.....	10.16	.....	.56	....	$ 26 81	$ 35 00	$ 8 19	160
170	Americus Ammoniated Bone Superphosphate	10.08	....	....	2.56	2.56	2.50 to 3.50	8.37	2.85	1.28	12.50	11.00 to 13.00	11.22	10.00 to 12.00	2.68	2.00 to 3.00	29 41	38 00	8 59	170
115	Bay State Fertilizer....................	14.80	.47	.59	2.04	3.10	....	8.00	1.86	1.23	11.09	.....	9.86	.....	2.43	....	29 26	40 00	10 74	115
123	" "	12.14	....	1.11	2.03	3.14	....	9.25	1.00	1.01	11.26	.....	10.25	.....	2.21	....	30 27	38 00	7 73	123
153	" "	12 70	....	.65	1.95	2.60	....	8.21	.92	1.76	10.89	.....	9.13	.....	3.30	....	27 83	38 00	10 17	153
	Average	13.21	...	....	....	2.95	2.10 to 2.50	8.49	1.26	1.33	11.08	.....	9.75	8.00 to 11.00	2.98	2.00 to 3.00	29 12	.....	9 55	
121	Bay State Superphosphate...............	11.70	....	....	2.68	2.68	....	8.35	1.44	1.47	11.26	.....	9.79	.....	2.09	....	27 29	38 00	10 71	121
131	" "	20.50	....	....	2.91	2.91	...	7.97	.62	2.08	10.67	.....	8.59	.....	1.98	....	26 50	38 00	11 50	131
	Average	16.10	....	....	....	2.80	2.50 to 3.00	8.16	1.03	1.78	10.97	10.00 to 11.00	9.19	9.00 to 9.50	2.04	1.00	26 90	.....	11 10	
117	Bowker's Hill and Drill Phosphate	14.45	....	.55	2.13	2.68	....	7.55	2.90	1.28	11.73	....	10.45	.....	1.35	....	27 62	40 00	12 38	117
130	" " " "	13.45	....	....	2.91	2.91	....	7.70	2.87	1.20	11.77	.....	10.57	.....	1.37	....	28 40	38 00	9 60	130
156	" " " "	12.52	....	.51	2.40	2.91	....	8.22	2.70	.91	11.83	.....	10.92	.....	1.93	....	29 46	40 00	10 54	156
	Average	13.01	....	....	....	2.83	2.50 to 3.25	7.82	2.82	1.13	11.78	11.00 to 13.00	10.65	9.00 to 12.00	1.55	2.00 to 3.00	28 49	.....	10 84	
163	Bowker's Ammoniated Dissolved Bone.....	10.66	....	....	2.55	2.55	1.50 to 2.50	7.36	2.53	1.74	11.63	11.00 to 13.00	9.89	10.00 to 12.00	1.35	1.00 to 2.10	26 43	38 00	11.57	163

Station Number	BRAND.	MANUFACTURER.	SAMPLED AT	Station Number.
112	Bradley's X. L. Superphosphate..............	Bradley Fertilizer Co., Boston, Mass....................	Bangor...............	112
129	" " "	" " " " "	Brunswick	129
146	" " "	" " " " "	North Gray............	146
141	Common Sense Fertilizer, No. 1................	Common Sense Fertilizer Co., Boston, Mass..............	Waterville	141
168	" " " "	" " " " " "	Oakland	168
167	Common Sense Fertilizer, No. 2................	Common Sense Fertilizer Co., Boston, Mass	Oakland	167
169	" " " Diamond D..........	" " " " " "	"	169
159	Crocker's Ammoniated Bone Superphosphate.....	Crocker's Buffalo Fertilizer & Chemical Works, Buffalo, N.Y.	Portland...............	159
120	Cumberland Bone Superphosphate..............	Cumberland Bone Co., Portland, Maine.................	Dexter	120
124	" " "	" " " " "	Gardiner..............	124
148	" " "	" " " " "	Gray	148

Station Number	BRAND.	Moisture.	Nitrogen. Of Nitrates.	Nitrogen. Of Ammonia Salts.	Nitrogen. Of Organic Matter.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Soluble.	Phosphoric Acid. Reverted.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total Found.	Phosphoric Acid. Total Guaranteed.	Phosphoric Acid. Available. Found.	Phosphoric Acid. Available. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Station Valuation of One Ton.	Selling Price of One Ton.	Selling Price Exceeds Valuation.	Station Number
																	$	$	$	
112	Bradley's X. L. Superphosphate........	13.77	.94	.18	1.93	3.05	....	8.29	1.45	1.86	11.60	.....	9.74	.....	2.25	....	29 17	40 00	10 83	112
129	" " "	13.80	....	.46	2.56	3.02	....	7.95	2.72	1.65	12.32	.....	10.67	.....	1.73	....	29 66	38 00	8 34	129
146	" " "	12.42	....	.40	2.24	2.64	..	8.43	1.59	2.28	12.30	.....	10.02	....	2.23	...	28 24	40 00	11 76	146
	Average	13.33	....	....	....	2.90	2.50 to 3.25	8.22	1.92	1.93	12.05	11.00 to 14.00	10.14	9.00 to 11.00	2.07	2.00 to 3.00	29 02	.....	10 31	
141	Common Sense Fertilizer, No. 1	11.85	....	....	....	1.91	....	1.28	2.08	.98	4.34	.....	3.36	.....	3.84	....	15 51	27 50	11 99	141
168	" " "	8.71	.53	....	1.16	1.69	....	.....	2.77	1.31	4.08	.....	2.77	.....	3.05	....	13 43	27 50	14 07	168
	Average	10.28	....	....	....	1.80	....	.64	2.42	1.14	4.20	.....	3.06	.....	3.45	....	14 47	.....	13 03	
167	Common Sense Fertilizer, No. 2.........	9.45	.74	....	1.28	2.02	....	.....	2.83	1.63	4.46	.....	2 83	.....	3.83	....	15 55	35 00	19 45	167
169	" " Diamond D....	8.59	.51	....	1.41	1.92	....	.....	2.92	1.30	4.22	.....	2.92	.....	3.33	....	14 67	20 00	5 33	169
159	Crocker's Ammoniated Bone Superphosp'te	10.32	....	....	3.37	3.37	2.90 to 3.70	7.79	1.70	1.82	11.31	9.00 to 14.00	9.49	8.00 to 12.00	1.57	.50 to 1.50	28 88	.....	.....	159
120	Cumberland Bone Superphosphate.......	14.07	.68	.64	1.98	3.30	....	7.47	2.40	2.85	12.72	.....	9.87	.....	3.05	....	31 47	40 00	8 53	120
124	" " "	14.03	.37	.96	1.92	3.25	....	7.09	4.35	.32	11.76	.....	11.44	.....	3.00	....	32 06	40 00	7 94	124
148	" " "	15.66	.29	1.00	1.91	3.20	..	10.76	.83	.63	12.22	.....	11.59	.	3.80	....	33 34	40 00	6 66	148
	Average	14.59	....	....	....	3.25	2.00 to 3.00	8.44	2.52	1.27	12.23	10.00 to 14.00	10.96	9.00 to 11.00	3.28	3.00 to 4.00	32 29	.....	7 71	

Station Number	BRAND.	MANUFACTURER.	SAMPLED AT	Station Number
132	Dirigo Fertilizer	Sagadahoc Fertilizer Co., Bowdoinham, Maine	Bowdoinham	132
142	" "	" " " " "	Waterville	142
157	" "	" " " " "	Freeport	157
151	Dow's Nitrogenous Superphosphate	Dow, Davis & Co., Boston, Mass.	New Gloucester	151
143	Farrar's Superphosphate	F. S. Farrar & Co, Bangor, Maine	Bangor	143
135	Flamingo Guano	Flamingo Guano Co., Baltimore, Md.	Augusta	135
139	" "	" " " " "	Watervilie	139
150	" "	" " " " "	New Gloucester	150
140	Red Beach Superior Bone Phosphate	Red Beach Plaster Co., Calais, Me.	Skowhegan	140
171	" " " "	" " "	Hampden	171
133	Sagadahoc Superphosphate	Sagadahoc Fertilizer Co., Bowdoinham, Maine	Bowdoinham	133
152	" "	" " " " "	New Gloucester	152

Station Number	BRAND.	Moisture.	Nitrogen. Of Nitrates	Nitrogen. Of Ammonia Salts.	Nitrogen. Of Organic Matter.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Soluble.	Phosphoric Acid. Reverted.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total Found.	Phosphoric Acid. Total Guaranteed.	Phosphoric Acid. Available Found.	Phosphoric Acid. Available Guaranteed.	Potash. Found	Potash. Guaranteed.	Station Valuation of One Ton.	Selling Price of One Ton.	Selling Price Exceeds Valuation.	Station Number
132	Dirigo Fertilizer	6.40	....	....	1.95	1.95	....	.27	4.68	4.91	9.86	.....	4.95	.....	3.69	....	$ 20 17	$ 26 50*	$ 6 33	132
142	" "	5.97	....	....	1.99	1.99	....	...	3.09	6.86	9.95	.....	3.09	.....	3.41	....	18 43	28 00	9 57	142
157	" "	7.42	....	....	1.71	1.71	..	....	4.32	7.31	11.63	.....	4.32	.....	3.18	....	19 38	29 00	9 62	157
	Average	6.60	...	....	..	1.88	2.00	.09	4.03	6.36	10.48	12.00	4.12	5.00	3.43	2.00	19 33	.....	8 51	
151	Dow's Nitrogenous Superphosphate	13.40	....	....	2.41	2.41	2.00 to 3.00	7.55	1.44	.72	9.71	.....	8.99	8.00 to 10.00	2.79	1.50 to 2.00	25 21	.....	.....	151
143	Farrar's Superphosphate	11.55	....	....	2.69	2.69	....	7.91	4.01	.24	12.16	.....	11.92	.....	2.13	...	29 78	35 00*	5 22	143
135	Flamingo Guano	18.75	...	....	....	.44	...	....	5.92	14.24	20.16	.....	5.92	.....	.13	....	21 77	35 00	13 23	135
139	" "	18.25	....	....	....	.49	....	....	4.29	15.66	19.95	.....	4.29	.....	.20	....	24 12	36 00	11 88	139
150	" "	16.40	....	....	....	.44	....	....	4.35	15.87	20.22	.....	4.35	.....	.23	....	24 08	38 00	13 92	150
	Average	17.80	....	....	....	.46	.60 to 1.00	....	4.85	15.26	20.11	.....	4.85	10.00 to 15.00	.19	.25 to .75	23 32	.....	13 01	
140	Red Beach Superior Bone Phosphate	12.10	....	....	2.51	2.51	....	8.00	.85	.67	9.52	.....	8.85	.....	1.00	....	23 46	37 00	13 54	140
171	" " "	13.11	....	....	2.58	2.58	....	8.16	1.12	.30	9.58	.....	9.28	.....	1.46	....	24 93	.....	.....	171
	Average	12.60	....	....	....	2.55	2.56	8.08	.99	.48	9.55	8.00 to 10.00	9.07	.....	1.23	2.20	24 20			
133	Sagadahoc Superphosphate	20.08	....	....	2.65	2.65	....	6.06	3.51	2.27	11.84	....	9.57	.....	3.72	....	28 49	32 00*	3 51	133
152	" "	21.00	....	....	2.60	2.60	....	5.31	4.04	2.56	11.91	.....	9.35	.....	3.03	....	27 50	32 00**	4 50	152
	Average	20.54	....	....	....	2.63	2.00 to 3.00	5.69	3.78	2.41	11.88	13.00	9.47	9.50 to 12.50	3.38	2.00 to 3.00	28 00	.....	4 00	

—* Price at factory. ** In large lot.

Station Number	BRAND.	MANUFACTURER.	SAMPLED AT	Station Number
127	Soluble Pacific Guano	Glidden & Curtis, Boston, Mass.	Litchfield Corner	127
128	" " "	" " " "	Brunswick	128
147	" " "	" " " "	North Gray	147
113	Standard Superphosphate	Standard Fertilizer Co., Boston, Mass	Bangor	113
126	" "	" " " " "	Pittston	126
149	" "	" " " " "	Dry Mills	149
136	Stockbridge's Corn Fertilizer	Bowker Fertilizer Co., Boston, Mass.	Augusta	136
154	" " "	" " " " "	Cumberland Center	154
158	" " "	" " " " "	Portland	158
118	Stockbridge's Potato Fertilizer	Bowker Fertilizer Co., Boston, Mass	Dexter	118
137	" " "	" " " " "	Augusta	137
155	" " "	" " " " "	Cumberland Center	155

Station Number	BRAND.	Moisture.	Nitrogen. Of Nitrates.	Nitrogen. Of Ammonia Salts.	Nitrogen. Of Organic Matter.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed.	Phosphoric Acid. Soluble.	Phosphoric Acid. Reverted.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total Found.	Phosphoric Acid. Total Guaranteed.	Phosphoric Acid. Available. Found.	Phosphoric Acid. Available. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Station Valuation of One Ton.	Selling Price of One Ton.	Selling Price Exceeds Valuation.	Station Number
127	Soluble Pacific Guano	12.02	.53	....	1.91	2.44	....	7.52	2.32	2.80	12.64	.....	9.84	.....	1.96	....	$ 27 34	$ 40 00	$ 12 66	127
128	" " "	13.65	.86	.72	.99	2.57	....	7.33	1.88	2.58	11.79	.....	9.21	.....	2.85	....	27 73	37 00	9 27	128
147	" " "	13.27	....	....	2.33	2.33	....	7.14	1.68	3.18	12.00	.....	8.82	.....	2.77	....	26 12	37 00	10 88	147
	Average	12.98	....	....	....	2.45	2.00 to 3.00	7.33	1.96	2.85	12.14	12.00 to 14.00	9.29	8.00 to 11.00	2.53	2.00 to 3.50	27 06	.....	10 94	
113	Standard Superphosphate	13.73	....	.36	2.36	2.72	....	7.60	1.49	1.87	10.96	.....	9.09	.....	2.81	....	27 26	38 00	10 74	113
126	" "	9.65	....	.63	2.68	3.31	....	8.80	1.96	1.30	12.06	.....	10.76	.....	2.33	....	31 22	40 00	8 78	126
149	" "	10.55	....	.91	2.21	3.12	...	8.56	2.07	1.43	12.06	.....	10.63	.....	2.29	.. .	30 49	40 00	9 51	149
	Average	11.31	....	....	....	3.05	2.50 to 3.50	8.32	1.84	1.53	11.69	.....	10.16	9.00 to 13.00	2.48	2.00 to 4.00	29 66	.....	9 68	
136	Stockbridge's Corn Fertilizer	12.45	.60	.93	2.73	4.26	....	5.94	2.02	1.52	9.48	.....	7.96	.....	4.36	....	32 09	42 00	9 91	136
154	" "	13.52	....	.74	2.53	3.27	....	9.98	2.41	.59	12.98	.....	12.39	.....	4.13	...	34 78	45 00	10 22	154
158	" "	9.37	....	1.45	1.89	3.34	....	9.28	2.53	.48	12.29	.....	11.81	.....	2.77	....	33 06	45 00	11 94	158
	Average	11.78	....	....	....	3.62	3.25 to 4.25	8.40	2.32	.86	11.58	.79	10.72	.....	3.75	4.00 to 5.00	33 31	.....	10 69	
118	Stockbridge's Potato Fertilizer	14.35	2.83	.14	.98	3.95	....	6.37	1.76	1.20	9.33	.....	8.13	.....	4.29	....	31 52	45 00	13 48	118
137	" "	12.65	.69	.92	2.51	4.12	....	5.36	2.17	1.38	8.91	.....	7.53	.....	4.49	....	30 98	42 00	11 02	137
155	" "	14.80	....	.84	2.25	3.09	....	9.60	.51	2.38	12.49	.....	10.11	.....	3.23	....	31 05	45 00	13 95	155
	Average	13.93	....	....	....	3.72	3.25 to 4.25	7.11	1.48	1.65	10.24	8.00 to 10.00	8.59	.....	4.00	5.00 to 6.00	31 18	.....	12 82	

Station Number	BRAND.	MANUFACTURER.	SAMPLED AT	Station Number
165	Seeding Down Fertilizer	Bowker Fertilizer Co., Boston, Mass	Auburn....................	165
161	Strawberry Fertilizer....................	Bowker Fertilizer Co., Boston, Mass	Auburn....................	161
119	Stockbridge's Top Grass Dressing..............	Bowker Fertilizer Co., Boston, Mass	Dexter	119
162	" " " "	" " " " "	Auburn....................	162
114	Wilkinson's Superphosphate	Wilkinson & Co., New York, N. Y....................	Bangor	114
125	" "	" " " "	Brunswick	125

Station Number	BRAND.	Moisture.	Nitrogen. Of Nitrates.	Nitrogen. Of Ammonia Salts.	Nitrogen. Of Organic Matter.	Nitrogen. Total. Found.	Nitrogen. Total. Guaranteed	Phosphoric Acid. Soluble.	Phosphoric Acid. Reverted.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total Found.	Phosphoric Acid. Total Guaranteed.	Phosphoric Acid. Available. Found.	Phosphoric Acid. Available. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Station Valuation of One Ton.	Selling Price of One Ton.	Selling Price Exceeds Valuation.	Station Number
																	$	$	$	
165	Seeding Down Fertilizer.................	10.62	....	....	2.64	2.64	2.50 to 3.50	8.62	3.30	1.70	13.62	.....	11.92	14.00 to 15.00	3.05	4.00 to 5.00	31 33	38 00	6 67	165
161	Strawberry Fertilizer....................	7.8	....	....	2.92	2.92	....	4.54	3.54	5.04	13.12	.....	8.08	.....	4.19	....	29 08	45 00	13 92	161
119	Stockbridge's Top Grass Dressing..........	10.20	....	2.30	2.70	5.00	....	6.34	1.72	.98	9.04	.....	8.06	.....	2.59	....	33 20	45 00	11 80	119
162	" " "	9.64	....	2.67	2.71	5.38	....	6.91	2.46	.80	10.17	.....	9.37	.....	2.84	....	36 73	45 00	8 27	162
	Average.........................	9.92	....	....	....	5.19	5.50 to 6.50	6.62	2.09	.89	9.60	6.00 to 8.00	8.71	5.00 to 6.00	2.71	2.50 to 3.50	34 97	.....	10 03	
114	Wilkinson's Superphosphate...............	12.90	....	....	2.14	2.14	....	6.40	2.02	.83	9.25	.....	8.42	.....	3.26	....	23 82	40 00	16 18	114
125	" "	14.90	....	....	2.10	2.10	....	7.17	2.23	.78	10.18	.....	9.40	.....	2.60	...	24 65	40 00	15 35	125
	Average	13.90	....	....	....	2.12	....	6.79	2.12	.81	9.72	.....	8.91	.....	2.93	....	24 23	.....	15 77	

For convenience of reference the following somewhat abridged summary of the averages of the previous tables has been arranged. Those who are interested to consult this table cannot fail to notice the low valuation of the several brands of the so called "Common Sense Fertilizers," and the large excess of selling prices. In one instance, that of the Common Sense Fertilizer No. 2, the cost is $19.45 per ton more than the price for which the same amount of plant food can be purchased in the markets, the excess of cost being considerable greater than the Station valuation. Common Sense Fertilizer No. 1 makes nearly as bad a showing. The figures of this table, as in all the other tables, show the pounds of the various ingredients in a hundred pounds of the fertilizer:

Table Showing the Average Composition of Samples Analyzed in 1886.

BRAND.	No. of Samples Analyzed.	Moisture.	Nitrogen.	Phosphoric Acid. Total.	Phosphoric Acid. Available.	Phosphoric Acid. Insoluble.	Potash.	Station Valuation of one Ton.	Selling Price Exceeds Valuation.
Acme Superphosphate	1	16.72	2.59	12.06	10.16	1.90	.56	$26 81	$8 19
Americus Ammoniated Bone Superphosphate	1	10.08	2.56	12.50	11.22	1.28	2.68	29 41	8 59
Bay State Fertilizer	3	13.21	2.95	11.08	9.75	1.33	2.98	29 12	9 55
Bay State Superphosphate	2	16.10	2.80	10.97	9.19	1.78	2.04	26 90	11 10
Bowker's Hill and Drill Phosphate	3	13.01	2.83	11.78	10.65	1.13	1.55	28 49	10 84
Bowker's Ammoniated Dissolved Bone	1	10.66	2.55	11.63	9.89	1.74	1.35	26 43	11 57
Bradley's X. L Superphosphate	3	13.33	2.90	12.05	10.14	1.93	2.07	29 02	10 31
Common Sense Fertilizer No. 1	2	10.28	1.80	4.20	3.06	1.14	3.45	14 47	13 03
Common Sense Fertilizer No. 2	1	9.45	2.02	4.46	2.83	1.63	3.83	15 55	19 45
Common Sense Fertilizer, Diamond D	1	8.59	1.92	4.22	2.92	1.30	3.33	14 67	5 33
Crocker's Ammoniated Bone Superphosphate	1	10.32	3.37	11.31	9.49	1.82	1.57	28 88	
Cumberland Bone Superphosphate	3	14.59	3.25	12.23	10.96	1.27	3.28	32 28	7 71
Dirigo Fertilizer	3	6.60	1.88	10.48	4.12	6.36	3.43	19 33	8 51
Dow's Nitrogenous Superphosphate	1	13.40	2.41	9.71	8.99	.72	2.79	25 21	
Farrar's Superphosphate	1	11.55	2.69	12.16	11.92	.24	2.13	29 78	5 22
Flamingo Guano	3	17.80	.46	20.11	4.85	15.26	.19	23 32	13 01
Red Beach Superior Bone Phosphate	2	12.60	2.55	9.55	9.07	.48	1.23	24 20	
Sagadahoc Superphosphate	2	20.54	2.63	11 88	9.47	2.41	3 38	28 00	4 00
Soluble Pacific Guano	3	12.98	2.45	12.14	9.29	2.85	2.53	27 06	10 94
Standard Superphosphate	3	11.31	3.05	11.69	10.16	1.53	2.48	29 66	9 68
Stockbridge's Corn Fertilizer	3	11.78	3.62	11.58	10.72	0.86	3.75	33 31	10 69
Stockbridge's Potato Fertilizer	3	13.93	3.72	10.24	8.59	1.65	4.00	31 18	12 82
Seeding Down Fertilizer	1	10.62	2.64	13.62	11.92	1.70	3.05	31 33	6 67
Strawberry Fertilizer	1	7.8	2.92	13.12	8.08	5.04	4.19	29 08	13 92
Top Grass Dressing	2	9.92	5.19	9.60	8.71	.89	2.71	34 97	10 03
Wilkinson's Superphosphate	2	13.90	2.12	9.72	8.91	.81	2.93	24 23	15 77

Ground Bone.

An examination of a few samples of ground bone has been made, and the results of both the mechanical and chemical analyses are given below. As can be seen by the schedule of prices of ingredients, the finer a bone is the greater its cost is considered to be. So far as it is a question of the use of ground bone by farmers, the degree of fineness is an important consideration.

Station No.	BRAND.	Manufacturer.	Sampled at	Station No.
134	Bone Meal................	Sagadahoc Fertilizer Co., Bowdoinham, Me.	Bowdoinham	134
138	Pure Ground Bone	Belknap & Son, Portland, Me	Augusta....	138
166	Ground Bone.............	" " " "	Lewiston....	166
164	Bowker's Fine Ground Bone	Bowker Fertilizer Co., Boston, Mass.	Auburn	164

Station No.	BRAND.	Finer than 1-50 Inch.	Finer than 1-25 Inch.	Finer than 1-12 Inch.	Nitrogen.	Phosphoric Acid.	Station Valuation.
134	Bone Meal......................	50	35	15	3.31	17.55	$32 67
138	Ground Bone....................	58	21	21	3.20	17.23	32 01
166	" "	39	28	39	3.64	18.72	33 16
164	Bowker's Fine Ground Bone....				3.25	18.54	

Sample 164 showed that it had been treated with acid, and so it can scarcely be valued on the same basis as ordinary ground bone. It contained 4.75 per cent of soluble phosphoric acid and only 5.17 per cent in the insoluble form.

WOOD ASHES.

Wood ashes have an important and increasing use in Maine agriculture. With regard to the benefits resulting from their application there is a wide difference of opinion, which is due, undoubtedly, to the fact that their effect varies greatly according to the character of the soil. There is abundant testimony to prove that in some instances the use of ashes has caused a large increase of crop, and proof that they often fail to produce an appreciable effect is certainly not wanting. Again, farmers differ in their estimates of the relative value of unleached and leached ashes, basing these estimates upon experience, without doubt. Whatever any observing farmer is willing to assert of the use of ashes on his land is probably correct for his own practice, but may not be for the practice of some other farmer. All the questions involved in the use of ashes cannot be answered, but the information here presented, which has been gathered from analyses and correspondence, is believed to be of practical value.

Samples of ashes have been gathered for analysis from various sources. The following table gives a description of them, together with the percentages found of the more important ingredients.

Station Number	KIND OF ASHES.	SOURCE OF ASHES.	Water.	Phosphoric Acid.	Potash. Soluble in Water.	Potash. Insoluble in Water.	Potash. Total.	Lime.	Remarks.
	Dump Ashes.								
64	Soft wood, mostly spruce..........	Dump where mill waste is burned	20.63	.64	2.38	.64	3.02	29.36	Taken after heavy rain.
66	" " "	" " "	3.84	1.50	1.35	1.27	2.62	31.22	" "
67	" " pine	" " "	-	.66	.40	1.13	1.53	37.72	" "
86	Mill waste, mostly spruce..........	" " " ...	-	1.58	1.90	1.16	3.06	38.72	From Mr. Walker, Basin Mills.
		Average....	-	1.09	1.51	1.05	2.56	34.25	
	Furnace Ashes.								
65	From spruce sawdust	From boiler furnace, clean'd out once a year	1.19	1.40	3.43	.96	4.39	35.90	Sampled by Station, from about 1,000 bushels.
68	Soft wood, mostly spruce	" week	-	1.27	.88	1 05	1.93	46.14	Taken from under boiler.
69	" " "	" "	.88	1.47	3.50	1.70	5.20	46.20	" "
		Average....	.69	1.38	2.60	1.24	3.84	42.75	
	Tan Bark Ashes.								
76	From spent tan bark.............	From boiler furnace, clean'd out once a week	1.05	1.44	.98	1.12	2.10	?	From Frank Gilman, Esq., Winn.
	Soft Wood, Household Fires.								
70	Unleached		4.64	1.78	2.64	2.01	4.65	23.62	From stock of W. S. Helier & Co., Bangor.
	Hard Wood, Unleached.								
71		Household fires..........	4.40	3.00	7.12	1.34	8.46	38.60	From stock of W. S. Helier & Co., Bangor.
74	Mostly hard wood, mixed..........		.80	2.56	7.74	1.26	9.00	36.59	From J. R. Learned, Esq., Auburn.
85	Pure birch wood	Waste of spool factory....	.06	6.05	10 43	1.61	12.04	39.07	From Calvin Chamberlain, Esq., Foxcroft.
82		Household fires	3.30	2.98	5.24	2.03	7.27	31.65	From J. Ernest Hammond, Esq., Bauneg Beg.
		Average....	2.14	3.65	7.63	1.56	9.19	36.48	

	Hard wood ashes, leached.								
72		Household fires...........	32.95	1.91	.46	.97	1.43	25.48	From stock of W. S. Helier & Co., Bangor.
75	Mostly hard wood, mixed..........	" "	31.25	1.54	.35	.93	1.28	20.00	From J. R. Learned, Esq., Auburn.
77	" " probably.......	Shipped from Michigan...	31.22	1.52	.90	.56	1.46	32.97	Sampled by Station at New Gloucester.
80		Household fires...........	31.40	1.96	1.13	.72	1.85	29.06	From J. Ernest Hammond, Esq., Bauneg Beg.
81		From Canada	25.43	1.60	.94	.59	1.53	31.12	" " "
73	Soft and hard wood, mixed	Household fires...........	34.05	1.42	.29	1.32	1.61	20.54	From stock of W. S. Helier & Co., Bangor.
		Average	31.05	1.66	.68	.85	1.53	26.53	

The above figures show the pounds of ingredients in a hundred pounds of ashes.

The next table gives a summary of the average composition of the ashes as classified in various classes:

	Water.	Phosphoric Acid.	Potash.			Lime.
			Soluble in Water.	Insoluble in Water.	Total.	
Dump ashes		1.09	1.51	1.05	2.56	34.25
Furnace ashes	.69	1.38	2.60	1.24	3.84	42.75
Tan bark ashes	1.05	1.44	.98	1.12	2.10	?
Soft wood ashes, unleached	4.64	1.78	2.64	2.01	4.65	23.62
Hard wood ashes, unleached	2.14	3.65	7.63	1.56	9.19	36.48
Leached ashes, mostly hard wood.	31.05	1.66	.68	.85	1.53	26.53

A few facts as plainly shown by the above analyses are worthy of mention, viz:

1. The total potash (potassium oxide) in the unleached hard wood ashes is 9.19 per cent, and in the unleached soft wood ashes is 3.65 per cent. In both cases the ashes contain considerable potash in a form not soluble in water, which is undoubtedly the silicate.

2. The hard wood unleached ashes contain on the average phosphoric acid equivalent to nearly eight per cent of phosphate of lime, while the soft wood ashes contain the equivalent of only about three per cent.

3. The analyses give no evidence that furnace ashes are less valuable than ashes from household fires, provided the wood is the same in both cases.

4. Leaching removed from the ashes all but about half a per cent of the potash soluble in water. The total potash in the leached ashes is found to average 1.53 per cent.

5. Leached ashes contain about one-third their weight of water.

6. The birch ashes, No. 85, are exceptionally valuable. Analysis shows them to contain phosphoric acid equivalent to 13.2 per cent phosphate of lime, and soluble potash (potassium oxide) equivalent to 15.3 per cent of carbonate of potassium or the "potash" of the markets. The phosphoric acid, potash and lime in forty pounds of these ashes (about a bushel) would cost in the locality where the spool factory is located, when purchased in equally valuable forms,

not far from 37 cents. If the sample sent fairly represents the ashes in bulk, they are especially well worth the attention of farmers who are conveniently near the locality where they are produced.

7. The ashes from mill waste are not quite up to the standard of soft wood ashes from household fires, as some of the potash has evidently been leached out. They are, however, too valuable to be allowed to go to waste, and must certainly be well worth applying to some clay lands.

The following are some of the important considerations involved in a discussion of the use of ashes:

1. The differences between leached and unleached ashes (*a*) in percentage composition, (*b*) compared by the bushel, and (*c*) in crop production.

2. The cost of the useful ingredients of ashes when purchased in other forms.

(1) When water is passed through hard wood ashes they lose nearly all the potassium carbonate that they contain, which constitutes something over one-tenth their weight. A portion of the water used in leaching is retained, amounting to about one-third the weight of the leached or one-half the wieght of the unleached ashes. A simple calculation shows that while an actual loss of dry substance takes place, one hundred pounds of dry unleached ashes would, in the process of leaching, increase in weight at least forty-five pounds. Compared pound for pound, then, the leached ashes contain much the smaller percentage of dry substance.

The opinion is often expressed that in buying leached ashes a much larger quantity of dry matter is obtained per bushel than in buying the unleached, this opinion arising, without doubt, not only from the greater weight of the leached ashes, but from the belief that ashes shrink greatly in bulk under the action of water. It seems, however, from all the data gathered up to this time, that the amount of dry matter in a bushel of leached ashes does not, on the average, vary greatly from the dry matter in a bushel of unleached. The greater weight of the leached ashes is due to the water they contain, and not to a change in bulk.

In response to several inquiries, the following statements have been obtained:

Statement of potash and soap manufacturer: Weight of leached ashes 70 pounds per bushel of five pecks, based on actual weighings. Unleached ashes estimated to weigh ten pounds per peck.

Statement of dealer in ashes and manufacturer of soap: Weight of unleached ashes fifty pounds per bushel, leached sixty pounds. One thousand bushels of unleached ashes will make one thousand bushels of leached.

Statement of dealer in Michigan ashes: Weight of unleached ashes forty pounds per bushel, leached sixty-three pounds.

If according to one estimate one bushel of unleached ashes makes one bushel of leached there is less dry matter in a bushel of the latter, for about one-tenth of the dry substance is leached out; but if unleached and leached ashes weigh forty and sixty-three pounds per bushel, respectively, there is only a small difference in the amount of dry matter in each, which is in favor of the leached ashes. This is shown by the following table:

		CONTAINING				
	Weight.	Water.	Dry Substance.	Phosphoric Acid.	Potash.	Lime.
One bushel unleached, hard wood ashes,	40 lbs.	0.8 lbs.	39 lbs.	1.46 lbs.	3.8 lbs.	14.6 lbs.
One bushel leached hard wood ashes,	63 "	20 "	43 "	1.04 "	1.0 "	16.7 "

The effect of ashes in increasing the productiveness of any soil can be attributed to two general causes, viz: The supply of plant food which the ashes furnish, and the decomposing action on the soil, similar to that of lime, caused mainly by the carbonate of lime in the ashes. On those soils deficient in potash, as experience shows some to be, the beneficial effect of ashes can be fairly attributed, in a large measure at least, to the potash which they supply.

If, on the other hand a farmer finds that purely potash manures, such as the German potash salts (the muriate and sulphate of potash), have no especial effect on his soil, then it is very probable that leached ashes would yield him as large returns as unleached, and at a less cost. The last table shows that with the exception of potash there are about the same amounts of the important ingredients in a bushel of the leached ashes analyzed, as in a bushel of unleached.

(2) The cost of the useful ingredients of ashes when purchased in other forms, as for instance in finely ground South Carolina rock, muriate of potash, and burned lime, would be approximately as follows:

UNLEACHED HARD WOOD ASHES.

1.5 lbs.	phosphoric acid	at 3 cts.	4.5 cents.
3.8 "	potash	at 4¼ "	16.1 "
14.6 "	lime	at ½ "	7.3 "
			27.9

LEACHED HARD WOOD ASHES.

1 lb.	phosphoric acid	at 3 cts.	3.0 cents.
1 "	potash	at 4¼ "	4.25 "
16.7 "	lime	at ½ "	8.35 "
			15.6

It is the custom in some portions of the State to apply leached ashes at the rate of 150 to 200 bushels per acre, costing from $27 to $36. The smaller quantity (150 bushels) would contain in the case of the household ashes analyzed, approximately, 150 pounds of phosphoric acid, 150 pounds of potash, and 2,500 pounds of lime. These quantities of useful ingredients could be supplied in 600 pounds of South Carolina rock (not treated with acid), 300 pounds of muriate of potash, and 40 bushels of lime. Of the important mineral ingredients of plants this would be considered a very liberal application, and would cost in the latter forms slightly less, probably, than in the form of leached ashes. The comparative effect in the two cases could only be determined by experiment, though there is no reason for supposing that it would be greatly different.

Those contemplating the use of ashes should bear in mind that they are only a partial and not a complete fertilizer, as they contain no nitrogen compound of any kind. They are, therefore, lacking in one important ingredient that farm manures and most commercial fertilizers contain, and this may be one of the reasons why ashes sometimes fail to produce the desired effect after a number of applications, or even a satisfactory effect at first. It is very doubtful whether ashes can be made a sole dependence for the production of grass or any other crop for a long series of years.

Harbor Mud.

This was sent to the Station by Hon. Fred Atwood of Winterport. The barrel of mud was received several weeks before being sampled, and when it was opened it emitted a strong odor of ammonia.

The following figures show the partial composition of the mud as analyzed, and also what the composition would have been approximately, had it not lost water by drying. The average composition of yard manure is given for comparison:

	Harbor Mud.		Yard Manure.
	As Analyzed.	Calculated.	
Moisture	20.74	50.00	71.30
Organic Matter	7.93	5.00	15.60
Mineral matter (ash)	71.33	45.00	13.10
Nitrogen	.87	.55	.50
Phosphoric acid	1.17	.74	.50
Potash	.95	.60	.40
Lime	2.34	1.48	.50

The above comparison shows that when the mud is calculated to contain fifty per cent of water it has more of the valuable ingredients of plant food than are found in average stable manure. It should be remembered, however, that the ingredients of the mud are not so readily available to plants as the same ingredients in farm manures, and also that deposits of marine mud vary greatly in composition. Mr. Atwood writes: "I learn that it [harbor mud] has been used successfully as top dressing, and a small quantity I used showed favorably." There appears to be no reason why deposits of marine mud of the quality analyzed may not be used with profit by farmers along the coast, but it seems doubtful whether it is in general sufficiently valuable to warrant transportation for any considerable distance.

Horn Pith.

A. L. Moore, Esq., of Limerick, Maine, sent to the Station a sample of horn pith, inquiring its value, as he could obtain a considerable supply of such material if desirable. After the analysis of the horn, the following reply was made to Mr. Moore:

REPLY.

The results of the analysis of the horn pith which you forwarded to me show it to be very rich material. It contains as follows:

Phosphoric acid .... 23.36 per cent.
Nitrogen .... 4.42 "

The above figures are about what would be found in the casė of a fine quality of ground bone. If you can buy the material at a fair figure and can get it finely ground without unusual expense, you will obtain a first-rate quality of ground bone at a reasonable cost, or what would perhaps be better, you can treat the ground bone with sulphuric acid and you will have a very fine dissolved bone. Treat 1,000 pounds of the bone with 500 pounds of 50 per cent acid. Such acid you can make by mixing carboy acid with water, in the proportion of eight of the former to five of the latter, by weight.

Ashes vs. Acid for Treating Ground Bone.

A letter was received from L. R. Damon, Dexter, Maine, containing the following inquiries:

1st. "What is the difference in the value of ground bone (very fine) as a fertilizer when cut with acid, and when cut with ashes?"

2d. "Is the phosphoric acid in the bone worth more for immediate use when cut with acid than when cut with ashes?"

A somewhat brief reply was made to these inquiries at the time of their receipt, but as the matter seems to be one of quite general interest, a more extended discussion of the treatment of bone with acid and ashes is given below.

When sulphuric acid (oil of vitriol) of the proper strength is added to bone in order to produce a superphosphate, important chemical changes occur at once.

The sulphuric acid takes away two-thirds of the lime from part or all of the posphate of lime present, and new compounds are formed. One of these new compounds is a phosphate of lime containing only one-third as much lime as did that of the bone, and which is as readily soluble in water as sugar. Another new compound is gypsum, being identical in composition with land plaster, excepting the impurities of the latter.

On the other hand, when ashes and bone are mixed together, and the mixture is kept in a moist condition, the chemical changes that take place go on slowly. While these changes are not so definite nor so well known as in the case of treatment with acid, they are in general as follows: The alkali (potash) of the ashes saponifies the fats, and brings more or less of the remaining animal matter into solution.

Doubtless fermentation goes on which destroys some of the organic matter, and unless precautions are taken a loss of nitrogen is likely to occur. This action of the ashes upon the organic part of the bone causes the bone to disintegrate to a greater or less extent, or at least to soften, so that it is easily broken down into a fine condition, provided the action of the ashes has been continued long enough.

There is no evidence, however, that the phosphate of lime in the bone has met with any chemical change, or that it is any more available to plants only so far as a change in the degree of fineness of the bone has rendered it so. The effect of the disintegration that occurs is important, nevertheless, in considering the question of availability.

Undoubtedly the bone treated with acid has the greater value for immediate use by plants. Neither science nor practice at present has any conclusive evidence to offer showing that there is any form of treatment to which phosphatic material can be subjected that renders the phosphoric acid so readily available as does the action of sulphuric acid.

THE PURCHASE OF FERTILIZING MATERIAL.

The proper object which a farmer has in view in the purchase of commercial fertilizers is to obtain a certain amount of plant food in forms adapted to his needs. Moreover, it is a part of good business management to accomplish this with the least possible expense. It seems perfectly proper that the Station should aid in securing such desirable results, if possible, by presenting a discussion of the sources of supply of fertilizing ingredients, accompanied by such suggestions in regard to methods of buying as are obviously consistent with economy.

Almost the entire bulk of commercial fertilizers sold in Maine at the present time consists of ammoniated superphosphates, complete fertilizers, so called, which contain nitrogen, phosphoric acid and potash.

These goods are bought, in almost all instances, of local dealers, in quantities small or large, as the consumer desires. They are, moreover, largely purchased on long credit, payment to be made "when the crop is sold." A method of buying differing widely from the above, and one which is increasing in favor, is for a number of farmers to co-operate in the purchase of a large quantity of unmixed chemicals for cash, these materials by simple mixture being converted into the kind of fertilizer that is desired. The relative advantages of the two methods can be better understood after a description of the fertilizing materials of the markets, and a statement of the ways in which these materials are combined in manufacture of superphosphates.

As before stated, the fertilizers sold in this State contain as high priced ingredients, almost without exception, nitrogen, phosphoric acid and potash. Scarcely anything but complete fertilizers are used by Maine farmers.

The first of these three ingredients, nitrogen, as used for agricultural purposes, has several sources. Nitrate of soda coming from South America, sulphate of ammonia which is a secondary product in the manufacture of burning gas, dried and finely ground blood from our slaughter houses, dried and ground fish, and other prepared animal products, known as ammonite or azotine are the principal materials which are used to furnish nitrogen to our superphosphates, *and they can also be purchased by the farmer ready for his use, unmixed with other material.*

Bone ash, or burned bones, bone black which is charred bone that has been used by sugar refiners, phosphatic guanos and South Carolina rock, are the sources of almost all the phosphoric acid of our fertilizers. When any one of these materials is treated with the proper amount of oil of vitriol (sulphuric acid) there results what is termed a *plain superphosphate*, viz: A fertilizer in which the phosphoric acid has been rendered largely soluble in water, and which contains scarcely any nitrogen or potash, such as dissolved bone black, dissolved South Carolina rock, etc., etc. *These plain superphosphates are now sold and used as such in very large quantities.*

The potash now used in commercial manures comes almost entirely from Germany. Included in the general term "potash salts," we have sulphate of potash, muriate of potash, and kainite, and dealers are now offering these to farmers for direct application to the soil.

In order to secure for the purposes of crop production the quantities of nitrogen, phosphoric acid and potash found in a ton of the leading fertilizers sold in this State, what of the above-named materials must a farmer buy?

Five of the leading brands of complete fertilizers sold in Maine this year contained on the average as follows:

Nitrogen,	2.92	per cent or	58.4	pounds	in a ton.
Phosphoric acid, available,	10.00	" "	200	"	"
Potash	2.60	" "	52	"	"

These ingredients can be obtained, for example, by the purchase of sulphate of ammonia, dissolved bone black and muriate of potash, guaranteed to contain the following percentages:

Sulphate of ammonia	20 per cent	nitrogen.
Dissolved bone black (high grade)	18 "	available phosphoric acid.
Muriate of potash	52 "	potash.

A simple calculation shows that in order to furnish 58.4 pounds of nitrogen, 200 pounds of available phosphoric acid and 52 pounds of potash from the materials just mentioned, the quantities given below would be necessary:

Sulphate of ammonia	292	pounds.
Dissolved bone black	1,112	"
Murate of potash	100	"
Total	1,504	"

If less concentrated goods are bought as for instance, nitrate of soda and dissolved South Carolina rock, larger quantities would be required.

Nitrate of soda	390	pounds.
Dissolved South Carolina rock	1,540	"
Muriate of potash	100	"
Total	2,030	"

The materials mentioned above are usually transported in bags containing 200 pounds, and if in proper condition can be easily and rapidly mixed with a shovel, giving a fertilizer that will compare favorably in both chemical and mechanical qualities with the best mixed fertilizers ordinarily sold. The matter of cost is the main thing under consideration, however. What would be the relative cost under the two plans previously mentioned, viz: Each farmer purchasing what he wishes of a local dealer in the form of some mixed fertilizer, on long credit, or an association if farmers buying in the markets large quantities of the materials described, paying cash down and bearing the cost of transportation and mixing? The popular price of ammoniated superphosphates, or the mixed fertilizers sold in Maine seems to vary from $38 to $40, there being some exceptions to this rule.

It has been possible during the past spring to buy the fertilizers of the first mixture suggested above, in ten-ton lots in New York, for cash, delivered on board the cars, at the prices mentioned below, or possibly a little cheaper:

Sulphate of ammonia	at	$72.50	per ton.
Dissolved bone black	"	26.00	"
Muriate of potash	"	40.00	"

For car-load lots, transportation from New York to Bangor, for instance, can be secured as low as $5.00 per ton.

The cost, then, of the mixture equivalent to a ton of an ordinary superphosphate delivered in Bangor, Maine, when bought by the plan suggested, can now be computed:

Sulphato of ammonia	292	pounds at	3⅝ cents	$10 58
Dissolved bone black	1,112	"	1 3 10 cents	14 45
Muriate of potash	100	"	2 "	2 00
Freight on	1,504	"	¼ "	3 76
Total				$30 79

If less concentrated materials are used, as in the case of the second mixture suggested, the cost would be about the same, excepting that the freight would be increased about $1.25.

The difference in cost of a given amount of plant food which is equivalent to a ton of our average superphosphates, when purchased by the two methods compared, seems to be from $7.00 to $9.00 in favor of the co-operative plan of buying concentrated, unmixed fertilizers, by the quantity, for cash. It is possible that by applying the same plan to the purchase of the ordinary mixed fertilizers, equally favorable results might be secured.

The suggestions that have been made in this connection have been offered in order to meet a growing demand for information in regard to the points discussed, rather than for the purpose of directly or indirectly criticising existing methods of trade in commercial fertilizers.

THE MANURE RESIDUE OF CORN MEAL AND OF COTTON-SEED MEAL.

Cattle foods vary greatly in the percentages which they contain of certain ingredients that have manurial value. It has been sufficiently well proved that the manure produced by any cattle food contains the larger part of the nitrogen, phosphoric acid and potash of the food, and consequently in about the same proportions. These facts are the scientific basis of the much repeated assertion that the manure residues of the various cattle foods differ greatly in value, and there certainly can be no fault in the reasoning which leads to the conclusion that the more of the principal ingredients of plant food manure contains, the greater will be its crop-producing power.

In seeming contradiction to this conclusion are the results of a series of field experiments begun in 1877 by Dr. Voelker under the auspices of the Royal Agricultural Society of England, and which have been commented upon, in one instance at least, as showing how far scientific theories may mislead as to actual results obtained in practice. Dr. Voelker compared for several years the relative effect of manure made in part from cotton-seed and manure made in part from corn meal, and while in the larger number of cases the cotton-seed manure gave better results than the corn meal manure, especially with roots, the general results with all crops in the rotation do not differ greatly in the two cases. It seems very probable that these experiments fail to show the comparative crop-producing power of the manure from the two sources, simply because the corn meal manure was able to supply the needs of crops grown on an already fertile soil, so that the greater amount of plant food in the cotton-seed manure was in part ineffectual. The work that the Station has undertaken to do, the results of which are reported here in part, was planned for the purpose of showing by a sort of object lesson, that there is an actual difference in the crop-producing power of manure from different foods, and not with the intention of demonstrating any new fact or principle. In order to secure the desired object two facts must be illustrated by actual results:

(1) That the quantities of nitrogen, phosphoric acid and potash of the manure stand in direct relation to the quantities of the same ingredients in the food.

(2) That the crop-producing power of two or more kinds of manure from different foods varies with the varying amounts of nitrogen, phosphoric acid and potash which they contain.

The method adopted for illustrating these facts was the following: (1) To feed an animal a given quantity of different foods, of known composition, the solid excrement and urine to be collected and analyzed in each case. (2) To use the manure residues obtained from the different foods in actual experiments in plant growth.

The animal selected for use in carrying on the work was a full-grown sheep (a wether). He was placed in a stall so small that he could not turn around, but large enough to allow him some freedom of motion, and he received his food in a box so constructed that no loss could occur. A uniform daily ration, accurately analyzed and weighed, was fed for twelve days in each period, and during the last four or five days of each period the solid excrement and urine were collected. The preliminary feeding of the first seven days was necessary to insure the complete removal from the stomach and intestines of any residue of previous food.

The solid excrement and urine were collected in two rubber bags attached to the animal by a light harness, that receiving the urine being connected with a bottle by a rubber tube. Between each period of feeding the animal was taken out of the stall and allowed to rest.

The periods of feeding were three in number, and the rations fed were as follows:

First period	600	grams	hay (about 1⅓ pounds.)*
	200	"	corn meal (about 4-9 pounds.)
Second period	600	grams	hay.
	200	"	cotton-seed meal.
Third period	600	grams	hay.
	200	"	corn meal.

On account of an error due to the faulty method used in the first period for collecting the urine, none of the results for that period are given in this connection.

Second Period. The following table shows the partial composition of the hay and cotton-seed meal fed during the second period, and also of the dry solid excrement and urine residue.

* 1000 grams are equal to 2.2 pounds, or one pound equals 454 grams.

TABLE SHOWING PARTIAL COMPOSITION OF HAY AND COTTON-SEED MEAL, AND OF MANURE RESIDUE FROM THE SAME.

	Containing in 100 lbs.		
	Nitrogen. lbs.	Phosphoric Acid. lbs.	Potash. lbs.
Timothy hay (air dry)	1.12	.36	1.48
Cotton-seed meal (air dry)	7.00	2.96	1.76
Solid excrement (water-free)	2.09	2.90	2.37
Urine (dried residue)	6.60		2.05

The solid excrement and urine were collected for five days. In the next table can be seen the weights of food fed and of material excreted, with the quantities of nitrogen, phosphoric acid and potash fed and excreted.

TABLE SHOWING AMOUNTS OF FOOD GIVEN, AND OF EXCREMENT COLLECTED FOR FIVE DAYS, WITH THE QUANTITIES OF VALUABLE INGREDIENTS FED AND EXCRETED.

	Total Weight.	Dry Residue.	Containing		
			Nitrogen.	Phosphoric Acid.	Potash.
	Grams.	Grams.	Grams.	Grams	Grams.
Timothy hay, 3000 grams fed	3000	....	33.6	10.8	44.4
Cotton-seed meal, 1000 grams fed	1000	....	70.0	29.6	17.6
Total in food	....	....	103.6	40.4	62.0
Solid excrement	4502	1289	26.8	37.4	30.5
Urine	2235	1271	83.9	....	26.1
Total excreted	6737		110.7	37.4	56.6
Quantity fed and and not excreted	....	....	....	3.0	5.4
Per cent excreted	....	....	106.8	92.6	91.3

The total excrement was in this case found to contain a little more nitrogen than the food, which was undoubtedly due to the fact that the animal lost flesh during his confinement.

Third Period. The percentages of nitrogen, phosphoric acid and potash in the hay and corn meal fed in this period, and in the material excreted, are as follows:

TABLE SHOWING PARTIAL COMPOSITION OF HAY AND CORN MEAL, AND OF MANURE RESIDUE FROM THE SAME.

	Containing in 100 lbs.		
	Nitrogen. lbs.	Phosphoric Acid. lbs.	Potash. lbs.
Timothy hay	1.00	.29	1.26
Corn meal	1.59	.49	.32
Solid excrement (water-free)	1.70	1.03	1.23
Urine (dried residue)	3.04		1.80

In this period the solid excrement and urine were collected for four days only.

The weights of food and of solid and liquid exrements are given below, together with the quantities of nitrogen, phosphoric acid and potash which the animal received and excreted.

TABLE SHOWING AMOUNTS OF FOOD GIVEN, AND OF EXCREMENT COLLECTED FOR FOUR DAYS, WITH THE QUANTITIES OF VALUABLE INGREDIENTS FED AND EXCRETED.

	Total.	Dry.	Containing		
			Nitrogen.	Phosphoric Acid.	Potash.
			Grams.	Grams.	Grams.
Timothy hay, 2400 grams fed	2400	......	24.00	6.96	30.24
Corn meal, 800 grams fed	800	......	12.08	3.92	2.56
Total in food	......	......	36.08	10.88	32.80
Solid excrement	2539	968	16.46	9.93	11.90
Urine	822	604	18.36	......	10 87
Total excreted	3361	......	34.82	9.93	22.77
Quantity fed and not excreted	......	......	1.26	.95	10.03
Per cent excreted	......	......	96.5	91.2	69.1

During these two periods the same quantity of hay was fed daily, the composition being nearly the same in each period, so that the differences in the amounts of nitrogen, phosphoric acid and potash excreted in the two cases must be due to the difference in composition of the corn meal and cotton-seed meal, of which equal quantities were also fed. In order to show plainly the great difference in the quantities of valuable elements of plant food contained in the manure in the cases compared, the weights of the nitrogen, phosphoric acid and potash in the food and manure for five days are placed side by side.

	Hay and Cotton-Seed Meal.		Hay and Corn Meal. *	
	In Food.	In Manure.	In Food.	In Manure.
Nitrogen	103.6 grams.	110.7 grams	45.10 grams.	43.53 grams.
Phosphoric Acid......	40.4 "	37.4 "	13.60 "	12.41 "
Potash...............	62.0 "	56.6 "	32.80 "	22.77 "

* Calculated from amount excreted for four (4) days.

The following statements briefly summarize the facts shown by the above figures.

(1) The ration of hay and cotton-seed meal contained nearly three times as much nitrogen, phosphoric acid and potash as the ration containing an equal weight of hay and corn meal.

(2) The amounts of nitrogen, phosphoric acid and potash in the manure residue stand in direct relation to the amounts of the same ingredients in the food, the loss in the present instance averaging only about ten per cent.

(3) The urine contained nearly half the potash of the total excrement, and from half to three-fourths the nitrogen, but no phosphoric acid, the latter being wholly in the solid excrement.

Experiments are now in progress to determine whether these manure residues have a crop-producing power that stands in direct relation to their composition.

COMPOSITION OF CATTLE FOODS.

The Station has analyzed, during the past year, seventeen samples of cattle foods, including species of the true grasses, clovers, weeds and grains, viz:

1	sample	Blue Joint.
2	"	Timothy.
1	"	Timothy and Red Top.
1	"	Alsike clover.
1	"	White clover.
1	"	Red clover.
1	"	Witch Grass.
1	"	Buttercup.
1	"	White Weed.
4	"	Corn and meal.
1	"	Corn-and-cob meal.
1	"	Cobs.
1	"	Cotton-seed meal.

Several of the above feeding stuffs were those used in the digestion and feeding experiments.

Explanations. The analysis of any plant or animal substance with reference to its use as a cattle food does not go so far as to determine the percentage of every single ingredient in the material analyzed, but only aims to learn the percentages of certain classes of compounds, the members of each class having a close resemblance in composition and in nutritive effect. Thus we have in all fodder tables several columns of figures headed by the following terms: Water, Ash, Protein, Crude Fiber, Nitrogen-free Extractive Matter, and Fats. As these terms are in constant use, not only in this report but in all agricultural literature, they are made the subject of such explanations as seem necessary in order to show their relation to animal nutrition.

The *water* or *moisture* of cattle foods, of which all contain more or less, is measured by the loss of weight which takes place when the substance is dried for some time at the temperature of boiling water, or 212° Fahrenheit. The percentage of water is very large in green crops, and comparatively small in all dried materials. In all feeding stuffs which exist in the air-dry condition, the percentage of moisture varies greatly according to the state of the atmosphere, so that in rainy or moist weather a given quantity of hay or grain that is at all exposed to the air will weigh considerable more than during a time of dryness. Freshly cured hay and newly harvested grain contain much more water than old hay and grain, the difference being an important consideration in buying or selling by weight. While the water in cattle foods has no nutritive value above water that an animal drinks, its presence or absence often has a marked influence upon the palatableness of feeding stuffs.

The *ash*, or mineral part of any food stuff, is that which is left after the combustible portion is burned away, and includes quite a number of compounds. The amount of ash in plants is influenced in a marked manner by their age, and conditions of growth, such as locality, kind of manuring, &c. The mineral compounds of cattle foods fill an important place in furnishing the material for building up the bony framework of the animal.

Protein (or *albuminoids*) is a collective term that includes quite a variety of compounds, which are distinguished from the members of the other important classes of substances in feeding stuffs by the fact that they contain nitrogen.

Such compounds as egg albumen, the muscular tissue of animals and the caseine of milk are albuminoids, and to these animal substances the albuminoids of plants bear a close resemblance both in chemical properties and in food value. The protein of feeding stuffs cannot be directly determined with accuracy. The estimation is an indirect one, and is based upon the fact that all albuminoids contain approximately 16 per cent of nitrogen. If, therefore, the percentage of nitrogen in any feeding stuff be multiplied by 6.25, the percentage of albuminoids is obtained with sufficient accuracy for all practical purposes. The important and peculiar office which albuminoids fill in serving the uses of the animal kingdom is that they constitute the only source of material for the formation of muscular tissue, hair, horn, caseine, etc., etc.

Plants contain other nitrogenous compounds called *amides* that occur most abundantly in fodder and root crops, the amount varying in the former at different periods of growth, while in the grains the nitrogen exists almost wholly in the form of albuminoids. Fodder tables generally give as the percentage of protein the product of the total percentage of nitrogen by 6.25.

A given amount of protein as stated for hay in tables of fodder analyses is not quite the same thing, therefore, as the same amount occuring in the grains, because in the former case much more of the nitrogen belongs to the non-albuminoid, or amide form.

The true value of amides in animal nutrition is not well defined. That they are wholly like albuminoids in office seems hardly probable, at least previous investigations do not show this.

Crude fiber is the woody part of plants, and is that which remains undissolved after treating vegetable substance with weak acids and alkalies. Paper and cotton fiber are good examples of nearly pure crude fiber.

The *nitrogen-free extractive matter* includes all the non-nitrogenous compounds of feeding stuffs, excepting crude fiber and the fats, the most important and abundant members of this class being starch and sugar.

The *fats* or vegetable oils are extracted from plant substance by ether, which also takes out more or less chlorophyl, wax, etc., especially in the case of hays and coarse fodders. Olive, linseed and cotton-seed oils are good examples of vegetable fats.

The starch, sugar and fats can play no part in the formation of flesh or the caseine of milk, but are alike in being a source of animal fat and heat.

Digestibility of feeding stuffs. The composition alone of any feeding stuff is a very imperfect standard by which to judge its food value. Of the food consumed by an animal, only that portion which is digested, *i. e.* that which is dissolved by the several digestive fluids and passes into the blood, can serve to maintain the vital functions, or to produce growth. Consequently, certain cattle foods, by being much more digestible than others, are much more completely utilized. The main facts pertaining to digestibility are presented farther on under the head of "Digestion Experiments," and the method of applying a knowledge of the composition and digestibility of feeding stuffs is shown in discussing the feeding experiments.

Description of the Feeding Stuffs Analyzed.

The samples of Alsike Clover (II), Red Clover (IV), Timothy (V), and Witch Grass (VI) were taken from a field where they were found growing near together, on July 13th, 1885. All the varieties had reached a condition of growth favorable for cutting, being in bloom, or very near it.

The White Clover (III) was a second growth taken from the College Campus, in full bloom.

The Blue Joint (I) was of very rank growth in a rich swale, cut July 13th, 1886.

The Buttercup (VII) and the White Weed (VIII) were cut when just past the period of full bloom.

Nos. XIV and XV belonged to the hay crop of 1884, and were taken from two lots of well-cured hay.

Nos. XVI and XVII were from the same general lot of meal ground from western corn.

No. XVIII was sampled from a lot of old-process, decorticated cotton-seed meal.

Nos. XIX, XX, XXI and XXII were from a fine lot of Flint corn grown in Orono.

Table Showing the Composition of Certain Feeding Stuffs.

Station Number	KIND OF FODDER.	Water.	Ash.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.	In 100 parts of water-free substance. Ash.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
I	Blue Joint	6.87	5.49	11.19	37.18	35.82	3.45	5.88	12.00	39.88	38.54	3.70
II	Alsike Clover	5.27	9.34	16.06	28.63	36.47	4.23	9.86	16.95	30.22	38.51	4.46
III	White Clover	8.68	7.05	20.00	20.26	38.21	5.80	7.72	21.90	22.16	41.87	6.35
IV	Red Clover	7.98	7.71	15.37	26 84	37.82	4.28	8.38	16.70	29.17	41.10	4.65
V	Timothy	7.05	6 02	7.13	35.80	40.59	3.41	6.47	7.67	38.50	43.70	3.66
VI	Witch Grass (*Triticum vulgare*)	6.25	6.37	8.75	34.58	41.11	2 94	6.79	9.33	36.88	43.86	3.14
VII	Buttercup (*Ranunculus acris*)	3.82	8.40	10.25	28.10	43.89	5.54	8.73	10.65	29.18	45.69	5.75
VIII	White Weed (*Leucanthemum vulgare*)	4.25	6.50	8.25	33.20	43.97	3 83	6.79	8.61	34.67	45.93	4.00
XIV	Timothy Hay	10.95	4.00	7.00	30.60	45.10	2.35	4.49	7.86	34.36	50.65	2.64
XV	Timothy Hay—with some Red Top	12.00	3.50	6.25	30.36	45.84	2.05	4.00	7.10	34.50	52.07	2.33
XVI	Corn Meal—Dent Corn	18.00	1.40	10.00	2.10	64.42	4.08	1.70	12.19	2.56	78.58	4.97
XVII	Corn Meal—Dent Corn	20.95	1.50	9.44	2.14	61.72	4.25	1.89	11.94	2.70	78.09	5.38
XVIII	Cotton-seed Meal	8.50	7.00	43.75	4.75	21.40	14.60	7.65	47.81	5.19	23.41	15.94
XIX	Corn—Flint	19.60	1.40	7.91	1.78	65.06	4.25	1.74	9.84	2.21	80.92	5.29
XX	Corn Meal—Flint Corn	18.25	1.45	8.25	1.86	66.03	4.16	1 77	10.09	2.27	80.77	5.09
XXI	Corn Cobs	21.50	2.11	1.56	36.70	37.83	.30	2.69	2.00	46.75	48.18	.38
XXII	Corn-and-cob Meal	12.60	1.90	7.81	9.35	64.55	3.79	2.17	8.94	10.69	73.86	4.34

Notes on the above analyses. (1) The large percentage of crude fiber in the Blue Joint is noteworthy. (2) The Alsike and Red clovers differ very little in composition. (3) So far as mere analysis can show the relative value of feeding stuffs, the Timothy seems to be inferior to both the Witch Grass and Blue Joint. (4) The Buttercup and White Weed do not appear to be inferior in composition to some of the grasses. (5) Analysis indicates no superiority of Maine-raised corn over western corn in the present instance.

Special Cattle Foods.

A class of cattle foods are offered for sale in our markets to a limited extent, for which special nutritive, stimulative, or medicinal properties are claimed, and which are sold at prices that range much above the market prices of ordinary cattle foods. Three foods of this character have been examined by the Station, with results that are deemed worthy of attention.

XII. Imperial Egg Food, cost 50 cents per pound.

X. Johnson's Continental Food, manufactured by H. S. Johnson, Lynn, Mass., cost 75 cents for one bag of 10 pounds.

XI. English Patent Food Company, Bangor, Me., cost $1.00 for one bag of 12 pounds.

Imperial Egg Food.

A partial analysis was made of this, as follows:

	Per Cent.
Moisture and organic matter	16.05
Mineral matter	83.95
Nitrogen	1.00
Equal to 6 25 per cent of protein.	
Carbonic acid	24.00
Equal to 55.6 per cent of carbonate of lime.	
Phosphoric acid	3.75
Equal to 14 to 17 per cent of bone.	

The pepper in the food furnishes a portion of the organic matter present; and analysis and examination with the microscope show that the mineral portion consists very largely of clam and oyster shells (the carbonate of lime) and bone or other phosphatic material, substances, the former of which can be bought for a fraction of a cent per pound, and the latter at less than two cents.

The food undoubtedly contains material that poultry men wisely feed to laying hens, but there seems to be no good reason why it should cost more than a small fraction of fifty cents per pound, or why it should be purchased in pound packages, as though it were especially valuable, when it is a mixture of ordinary, cheap substances.

X. Continental Food. XI. English Patent Food.

The Station analyses of these foods are given below, and also the average composition of wheat bran, for comparison:

	Continental Food.	Eng. Patent Food.	Wheat Bran.
Water	11.78	10.36	12.04
Ash	3.86	2.69	5.83
Protein	14.62	13.50	14.54
Crude Fiber	4.83	3.02	8.79
Other Carbohydrates	60.95	67.23	55.16
Fats	3.96	3.30	3.66

No. X has a composition agreeing closely with the average composition of wheat bran, and wheat middlings as well, and a mechanical examination shows that the food is undoubtedly wheat bran with possibly some middlings.

No. XI appears to be made up of middlings and corn meal, largely middlings, and the analysis shows a composition such as would be expected from this mixture. Both foods contain some fenugreek, an aromatic seed which is a prominent constituent of condition powders; and No. X contains a little sulphur. The foods have no greater nutritive value than the wheat bran, middlings and corn meal, from which they are made, while the small quantities of fenugreek and sulphur are utterly valueless to a well animal, and a poor reliance as a means of curing a sick one. If an animal is well he only needs plenty of good food,—if he is sick the wise course is to employ remedial agents suited to the case.

DIGESTION EXPERIMENTS.

The composition of American cattle foods is now quite well known. Very little has been done so far, however, in ascertaining the digestibility of our feeding stuffs. The analysis of a cattle food is a comparatively easy matter, while the determination of its digestibility is somewhat laborious and demands much precaution and care in the execution of the necessary work. So far, American experiment stations have given this line of investigation very little attention, and we have depended for our knowledge of the digestibility of the various classes of cattle foods upon the results worked out by German experiment stations.

For some kinds of feeding stuffs, as for instance the grains, the German figures are most probably practically the same as would be obtained in this country, while the hays and similar foods may be so affected in composition by the influence of climatic and other conditions of growth as to make their digestibility quite different from that of foreign products. The Station has made trials of the digestibility of two feeding stuffs, viz: Timothy hay, and corn (maize kernel) in various forms.

The main facts of digestion, and those upon which the methods of digestion experiments are based, are the following: A portion of the food which an animal eats is dissolved by the several digestive fluids with which it comes in contact, viz: the saliva, gastric juice, pancreatic juice, etc. That which is dissolved, or digested, is absorbed by certain vessels which are distributed over the lining of the stomach and intestines, passes into the blood, and is then used to maintain and build up the animal body. The undissolved or undigested portion of the food is carried along the alimentary canal, passes from the body as the solid excrement or dung, and constitutes that part of the food which is useless for the purposes of nutrition. The method of ascertaining the digestibility of any cattle food is simple in principle. An animal is fed a weighed quantity of food, of which the composition is determined by analysis. The solid excrement is collected, weighed and analyzed, and the amount digested is the difference between that which is fed and that which is excreted. As the process of digestion is slow, it is necessary to feed the animal on the weighed ration several days before collecting any excrement, in order that the contents of the intestines may become wholly freed from the residue of the previous food, so that the dung collected shall come wholly from the food tested. On account of the irregularity with which dung is voided, it is collected for several days, and from the total amount the average for one day is calculated.

Digestibility of Timothy Hay.

The feeding trials, which have furnished the data for calculating the digestibility of Timothy hay, were not undertaken as digestion experiments merely, otherwise the plan followed would have been somewhat different.

The original purpose of the trials was to obtain the results previously mentioned under the head of "The Value of the Manure Residue from Corn-Meal and Cotton-Seed Meal." In these experiments the Timothy hay was fed in connection with corn meal and cotton-seed meal, and the digestibility of the hay is calculated by assuming for the corn meal and cotton-seed meal the average rate of digestibility as found by previous experiments. While this method admits of a larger possible error than if the hay had been fed alone, the variations in the digestibility of corn meal and cotton-seed meal as determined by different experiments have been small and are not sufficient to seriously affect the accuracy of the calculations.

The animal used in the feeding trials was a full-grown wether. He was placed in a stall that allowed him sufficient freedom of motion, but so narrow that he could not turn around. His rations were given to him in a feeding box so arranged that no waste could occur. He was fed during three periods, the first two periods occupying twelve days each, and the third eleven days. The dung was collected for the last five days in Periods 1 and 2, and for the last four days in Period 3, being received in a rubber lined bag attached to the sheep by means of a harness.

The rations fed were the following:

Period 1	600 grams	Timothy hay	(about $1\frac{1}{3}$ pounds.)
	200 "	corn meal	(about 4–9 ")
Period 2	600 grams	Timothy hay.	
	200 "	cotton-seed meal.	
Period 3	600 grams	Timothy hay, mixed with some Red Top.	
	200 "	corn meal.	

The composition of the hay, corn meal and cotton seed meal fed is shown in the previous table giving the composition of certain cattle foods.

The composition of the water-free dung was found to be as follows:

	Ash.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
Period 1	9.59	10.84	35.61	40.38	3.58
Period 2	10.45	13.06	33.29	40.21	2.98
Period 3	7.27	10.63	35.58	43.22	3.30

We now have the data necessary for calculating the digestibility of the Timothy hay.*

*Note. The figures taken for the digestibility of corn meal are those given in Armsby's Manual of Cattle Feeding, and for the cotton-seed meal they are the average of results obtained by Armsby and Wolff. They represent the percentages, or pounds in a hundred, digested of the various ingredients:

	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fat.
Corn meal	89	79	62	91	85
Cotton-seed meal	80.6	86.7	-	75.8	95.4

Tables Showing the Digestibility of Timothy Hay.

Period 1.

	Dry Substance.	Organic Matter	Protein	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams
Fed, 600 grams hay	534.3	510.3	42.	183.6	270.6	14.1
Fed, 200 grams corn meal..	164.	161.2	20.	4.2	128.8	8.2
Total fed.........	698.3	671.5	62.	187.8	399.4	22.3
Excreted, 764.2 grams dung	259.4	234.5	28.1	92 4	104.7	9.3
Total digested....	438.9	437.0	33.9	95.4	294.7	13.0
Digested from the corn meal	-	143.5	15 8	2.6	117.2	6.9
Digested from the hay ...	-	293.5	18.1	92 8	177.5	6.1
Per cent digested from hay,	-	**57.5**	**43.0**	**50.5**	**65.6**	**42.8**

Period 2.

	Dry Substance.	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams
Fed, 600 grams hay.......	534.3	510.3	42.	183.6	270.6	14.1
Fed, 200 grams cotton-seed meal	183.	169.	87.5	9.5	42.8	29.2
Total fed.........	717.3	679.3	129.5	193.1	313.4	43.3
Excreted, 900.4 grams dung	257.8	230.8	36.4	85.8	103.6	7.7
Total digested....	459.5	448.5	93.1	107.3	209.8	35.6
Digested from cotton-seed meal..................	-	136.2	75.8	-	32.4	27.9
Digested from the hay	-	312.3	17.3	-	177.4	7.7
Per cent digested from hay,	-	**61.2**	**41.1**	-	**65.5**	**54.6**

PERIOD 3.

	Dry Substance.	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams
Fed, 600 grams hay	528.	507.	37.5	182.1	275.	12.3
Fed, 200 grams corn meal..	158.1	155.1	18.9	4.3	123.5	8.5
Total fed.........	686.1	662.1	56.4	186.4	398.5	20.8
Excreted, 634.8 grams dung	241.0	224 3	25.7	86.1	104.5	8.0
Total excreted....	445.1	437.8	30 7	100.3	294.0	12.8
Digested from the corn meal	-	138.0	14.9	2.6	112.3	7.2
Digested from the hay.....	-	299.8	15.8	97.7	181.7	5.6
Per cent digested from hay,	-	**59.1**	**42.1**	**53.6**	**66.1**	**45.5**

A summary of the results obtained shows a fairly good agreement between those of the three periods.

DIGESTIBILITY OF TIMOTHY HAY.

	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
First Period	57.5	43.0	50.5	65.6	42.8
Second Period	61.2	41.1	?	65.5	54.6
Third Period..........................	59.1	42.1	53.6	66.1	45.5
Average	59.3	42.1	52.	65.7	47.6

The above figures, which are called *coefficients of digestibility*, represent the amount that is digested out of each hundred pounds or parts of the several ingredients of the hay. For instance, if a hundred pounds of protein were fed to a sheep in Timothy hay of the kind used in the experiments, about forty-two pounds would be digested. So far as we are able to judge from the composition and digestibility of Timothy hay grown in Maine, it does not take a comparatively high rank as a stock food, Clover hay, for instance, being better in composition and more digestible.

Digestibility of Maize Kernel (Corn) in Various Forms.

The digestibility of maize meal has been made the subject of inquiry in several German experiments, and each trial has given practically the same results. It is believed, however, that no attempt has ever been made to learn the effect upon digestibility of feeding the maize kernel whole, or of grinding it with the cobs and feeding the corn-and-cob meal. During the last few months, the Station has carried on trials of the digestibility of corn fed whole, corn meal, and corn-and-cob meal. The corn used in these trials was raised in Orono, was perfectly sound, and was a fine specimen of the Flint variety. It was purchased on the ear and one portion was simply shelled and fed whole, another portion was shelled and ground and fed as pure meal, and still another portion was ground with the cobs and fed as corn-and-cob meal.

The animal used in these trials was a boar pig, weighing about fifty pounds. He was kept in a stall so narrow that he could not turn around, and was fed in a trough arranged so that waste was entirely prevented. The dung was very successfully collected in a rubber-lined bag attached to the animal by a close-fitting harness. The floor of the stall was kept brushed clean, so that if any excrement had fallen outside the bag it could easily have been seen.

Digestibility of maize kernel fed whole. In this trial the pig was fed 787 grams (about one quart)* of whole corn daily, in three equal portions. The weighed ration was fed for twelve days, the dung being collected during the last five. The total weight of dung collected during five days was 1557 grams, containing 35.54 per cent or 553.4 grams of water-free substance, which would be at the rate of 110.7 grams of water-free dung daily.

*One quart equals 794 grams, but through an error of calculation 787 grams were taken instead.

The composition of the corn fed can be seen in the previous table giving the analysis of certain feeding stuffs, No. XIX.

Of the 553.4 grams of water-free dung, 104.3 grams consisted of kernels that were not broken, this being about three and one-third per cent of the whole quantity of kernels fed. Still more of the kernels were only partially crushed. Below is given the composition of the unbroken kernels in the dung and of the dung after the whole kernels were taken out:

	Ash.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
Unbroken kernels—water-free.	1.95	9.60	2.70	79.80	5.95
Dung without unbroken kernels—water-free	7.89	19.41	8.99	44.87	18.84

By comparing the composition of the whole kernels that passed through the animal with the composition of the corn as it was fed, it can be seen that the unbroken corn suffered very little change, the digestive fluids having little or no effect upon it.

From the data already given, the digestibility of the whole-fed corn is calculated:

PERIOD 1—WHOLE CORN.

	Dry Substance.	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams
Fed, 787 grams whole corn..	632.7	621.7	62.3	14.	512.0	33.4
Excreted, 311.4 grams dung,	110.7	103 3	19.5	8.6	57.0	18.2
Digested	522.0	518.4	42.8	5.4	455.0	15.2
Per cent digested from whole corn	**82.5**	**83.4**	**68.7**	**38.3**	**88.8**	**45.**

Digestibility of corn meal. The same amount of corn meal was fed in this period as of whole corn in Period 1, viz: 787 grams daily, the times of feeding and collection of dung being the same also. The dung collected during the five days weighed when fresh 1,136 grams, containing 29.75 per cent or 338 grams of water-free substance. The average amount of water-free dung excreted daily was, therefore, 67.5 grams. The analysis of the meal fed is given in the table to which reference has been made,—sample No. XX. The following is the composition of the water-free dung for this period:

	Ash.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
Water-free dung from corn meal....	17.67	13.44	15.41	44.57	8.91

The figures for the digestibility of the corn meal follow:

PERIOD 2—CORN MEAL.

	Dry Substance.	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams
Fed, 787 grams corn meal...	643.2	632.	64.9	14.6	519.6	32.7
Excreted, 227.2 grams dung,	67.5	55.7	9.0	10.3	30.	6.0
Digested	575.7	576.3	55.9	4.3	489.6	26.7
Per cent digested from corn meal...	**89.5**	**91.2**	**86.1**	**29.4**	**94.2**	**81.7**
Average of all German trials with pig	-	92.	86.	40.	95.	76.

It is gratifying to note that the results of the Station trial agree very closely with similar results obtained from German experiments.

Digestibility of corn-and-cob meal. The amount of corn-and-cob meal fed daily in this period was 969 grams or a quantity very nearly equivalent to 787 grams of the kernel when accompanied by the cobs. The animal was fed for twelve days, and the excrement was collected for the last five days, as in the two preceding periods. The total fresh dung collected in the five days was 3,727 grams, containing 27.69 per cent, or 1032 grams of water-free substance, the average daily excretion of water-free dung being 206.4 grams, with the composition shown below:

	Ash.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
Water-free dung from corn-and-cob meal	6.77	8.92	31.38	49.74	3.19

The composition of the corn-and-cob meal has already been given, No. XXII, in the table of analyses of feeding stuffs.

PERIOD 3—CORN-AND-COB MEAL.

	Dry Substance.	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams
Fed, 969 grams corn-and-cob meal....................	846.9	828.5	75.7	90.6	625.5	36.7
Excreted, 745.4 grams dung.	206.4	192.6	18.4	64 8	102.6	6.6
Digested........	640.5	635.9	57.3	25.8	522.9	30.1
Per cent digested from corn-and-cob meal...........	**75.6**	**76.7**	**75.7**	**28.5**	**83.6**	**82.**

A comparison can now be made between the amounts of digestible matter obtained from corn when fed in the three forms mentioned.

The effect of grinding corn upon its digestibility. The effect in the present instance can be seen easily by placing side by side the figures showing the digestibility of the whole corn and of the corn meal.

	Digested from Whole Corn.	Digested from Corn Meal.	Greater Digestibility of Corn Meal.
Organic matter	83.4	91.2	7.8
Protein	68.7	86.1	17.4
Crude fiber	38.3	29.4	
Nitrogen-free extractive matter	88.8	94.2	5.4
Fats	45.6	81.7	36.1

Of the total organic matter in the corn, nearly eight pounds more in a hundred were digested from the corn meal than from the whole corn, while with the protein, or albuminoid material, the difference was still greater, being 17.4 pounds in a hundred, or about one-sixth the protein fed. The difference in the digestibility of the nitrogen-free extractive matter (mostly starch and sugar) was much less. Granting that further trials prove these figures to be correct, it is shown that in feeding a bushel of corn without grinding, about $4\frac{1}{3}$ pounds more of organic matter, or approximately five pounds more of the kernel, would be wasted in the excrément than in feeding the same weight of meal.

The effect of feeding the cobs upon the amount of digestible matter. It has been claimed by many that there is considerable advantage in feeding corn cobs ground with the kernel, the reason for this being that the presence of the ground cobs produces a mechanical condition more favorable to digestion. It is seen, however, that corn meal fed without the cobs has so high a rate of digestibility that there is very little chance for any increase. There seems to be no reason, nevertheless, why the cobs should not be digested to some extent, and if so, corn-and-cob meal would furnish somewhat more of digestible material than meal from the kernel alone. Some information on this point can be obtained from the trials of the digestibility of corn meal, and corn-and-cob meal.

When the corn was shelled it was found that thirteen (13) pounds of cobs accompanied fifty-six (56) pounds of kernels. Samples of the kernels and cobs were taken for analysis at the time of shelling, and the amount of dry substance in each was determined. Fifty-six pounds of kernels contained forty-five (45) pounds of dry matter, and thirteen (13) pounds of cobs contained 10.2 pounds.

The dry matter of the corn-and-cob meal would be divided, therefore, between the kernels and the cobs in the ratio of 45 to 10.2.

Having these data, and knowing the digestibility of both the corn meal and the corn-and-cob meal, it is possible to calculate the increase of digestible matter from feeding the cobs. In the trial with corn-and-cob meal 846.9 grams of water-free substance were fed daily, 81.52 per cent of which came from the kernel.

	Organic Matter.	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	Grams.	Grams.	Grams.	Grams.	Grams
Digested from the corn-and-cob meal..	635.9	57.3	25.8	522.9	30.1
Digested from the kernels alone	618.5	59.4	4.6	525.3	28.7
Difference when cobs were fed ..	17.4	-2.1	21.2	-2.4	1.4

The cobs furnished 156.5 grams of organic matter to the daily ration, and the increase of organic matter digested when the cobs were fed was 17.4 grams. It appears from this that eleven per cent, or about one-ninth of the organic matter of the cobs, was digested. It also appears from the above figures that this increase of digestible matter falls almost entirely upon the crude fiber of the cobs, material that probably has the least value of any of the prominent ingredients of feeding stuffs.

EXPERIMENT IN FEEDING COTTON-SEED MEAL FOR MILK AND BUTTER PRODUCTION.

In this experiment the main question asked was the following: In feeding for milk or butter production, is it profitable to add some cotton-seed meal to the ration as a substitute for a portion of the corn meal?

Result of the experiment: Under the conditions involved in the experiment, the substitution of cotton-seed meal for an equal quantity of the corn meal unmistakably increased the production of milk and butter to a profitable extent.

The experiment was conducted with three thoroughbred Jersey cows:*

Belle of West Meadow,	age 11 yrs,	calved	July 22d, 1885.
Helen Hart,	" 9 "	"	Aug. 5th, "
Juno,	" 11 "	"	" 23d, "

These cows were fed on the experimental rations during three periods of four weeks each, the first period beginning Dec. 15th.

During each period all the cows were fed alike, and the rations were the following:

First Period	18 pounds	hay, mostly Timothy.
	3 "	corn meal.
	2 "	cotton-seed meal.
Second Period	18 pounds	hay, mostly Timothy.
	5 "	corn meal.
Third Period	18 pounds	hay, mostly Timothy.
	3 "	corn meal.
	2 "	cotton-seed meal.

As can be seen, the rations for the first and third periods were alike. The hay was the same in quantity and quality throughout.

The facts recorded during the experiment were,

(1) The weight of the cows at the beginning and end of the periods.

(2) The weights of the milk of each cow at each milking.

*Note. These cows became affected with tuberculosis and were finally killed, but at the time of the experiment the disease had not made sufficient progress to influence either the production or composition of the milk, except that the quality of the butter from Helen's milk was not good during the last period.

(3) The percentage of cream from each cow in each milking.

(4) The percentages of solids and fat in the milk of each cow in each milking.

(5) The total weight of butter from the milk of each cow.

The records of weights and composition of milk, percentages of cream and weights of butter, were only kept during the last two weeks of each period, the feeding for the first two weeks being necessary in order to bring the flow of milk fully under the influence of the new ration.

In the various tables which follow an effort has been made to arrange the data obtained so as to show as plainly as possible the results of the experiment.

(1) *Composition of milk.* The first table shows the average composition of the milk of each cow during two weeks of each period. There was contained in 100 pounds of milk:

	Belle.		Helen.		Juno.	
	Solids. lbs.	Fat. lbs.	Solids lbs.	Fat. lbs.	Solids. lbs.	Fat. lbs.
First Period	14.51	5.24	13.77	4.63	14.36	4.81
Second Period	15.62	5.84	13.88	4.68	14.48	4.94
Third Period	15.11	5.61	14.89	5.20	15.35	5.42

The percentages of solids and also of fat gradually increased during each period, with a single exception in the case of Belle, a result to be expected even with uniform feeding. It is generally, if not always true, that a cow's milk becomes more concentrated as the time from the date of calving lengthens.

(2) *Production.* The next tables show the weight of milk yielded by each cow during two weeks of each period, the total amounts of solids and fat that the milk contained, and the weight of unsalted butter churned from the fourteen days' milk of each cow.

BELLE (Yield for 14 days.)

	Weight of Milk—lbs.	Weight of total Solids—lbs.	Weight of actual Fat—lbs.	Weight of unsalted Butter-lbs	
First Period.........	194¼	28.19	10.18	10.69	
Second Period	143¼	22.38	8.37	8.50	2.19 lbs. less butter than 1st Period.
Third Period	162¼	24.52	9.10	9.81	1.31 lbs. more butter than 2d Period.

HELEN (Yield for 14 days.)

	Weight of Milk—lbs.	Weight of total Solids—lbs.	Weight of actual Fat—lbs.	Weight of unsalted Butter-lbs.	
First Period.........	221½	30.50	10.26	10.63	
Second Period.......	168⅞	23.44	7.90	7.75	2.89 lbs. less butter than 1st Period.
Third Period	151¼	22.52	7.87	7.81	.06 lbs. more butter than 2d Period.

JUNO (Yield for 14 days.)

	Weight of Milk—lbs.	Weight of total Solids—lbs.	Weight of actual Fat—lbs.	Weight of unsalted Butter-lbs.	
First Period.........	271⅛	38.93	13.04	13.81	
Second Period.......	181⅞	26.33	8.98	8.25	5.56 lbs. less butter than 1st Period.
Third Period	184¾	28.36	10.01	10.13	1.88 lbs. more butter than 2d Period.

In studying the figures of the above tables it should be remembered that there was a tendency, even with uniform feeding, for the flow of milk to gradually diminish. The marked decrease in yield in the case of all the cows in passing from the first to the second period, or from a mixture of cotton-seed meal and corn meal to corn meal alone, can be partly accounted for by this fact, but not wholly. When in the third period the cows returned to a ration similar to that of the first period, or one containing cotton-seed meal, not only was the tendency to diminished flow of milk overcome, but the yield was increased above that of the second period, except in the case of Helen, where the yield for the second and third periods differed but very little. The decrease in butter production in passing from the first to the second period was 2.19 pounds, 2.89 pounds, and 5.56 pounds for Belle, Helen and Juno respectively, and the increase in passing to the third period was, in the same order, 1.31 pounds .06 pounds and 1.88 pounds. The average yield for the first and third periods exceeded the yield for the second period as follows: Belle, 2.25 pounds butter; Helen, 1.47 pounds butter; Juno, 3.72 pounds butter. The total increase of expense caused by feeding cotton-seed meal was about 5.6 cents for fourteen days, leaving a balance in favor of the cotton-seed meal of $0.50, $0.31 and $0.87 for the three cows respectively during fourteen days, reckoning the butter to be worth 25 cents a pound.

The weights of milk produced by the cows in the different periods, as seen in the above tables, are deceptive as showing the relative effect of the two rations, simply because the milk varied in composition, so that a pound of milk taken in the last period, for instance, was not the same as a pound of milk in the first period. In order to make a proper comparison it is necessary to calculate what the yield of milk would have been with a uniform composition. If the milk had uniformly contained twelve per cent of solids, and the yield of solid matter had been what it actually was, the comparative production would have been as follows:

	Belle. lbs.	Helen. lbs.	Juno. lbs.
First Period	235	254	325
Second Period	186	195	220
Third Period	204	188	236

(3) *Weights of cows.* The cows were weighed two days in succession at the beginning of the first period, and at the end of all the periods. With the exception of Juno, the weights varied but little, not more, or even as much as might be caused by changes in the contents

of the stomach and intestines. The weights of the cows (average of two weighings) as given below do not show that the changes in yield of milk bore any definite relation to the changes in the weights of the animals.

	Weights of Cows.			
	First Period. Beginning.	First Period. End.	Second Period. End.	Third Period. End.
Belle	925 lbs.	930 lbs.	931 lbs.	918 lbs.
Helen	955 "	925 "	913 "	916 "
Juno	935 "	858 "	928 "	911 "

(4) *Relation of quantity of butter to actual quantity of fat in milk.* It has often been loosely asserted that the quantity of fat in a cow's milk as determined by chemical analysis is not a safe standard by which to judge the capacity of the cow for butter making, or in other words, that "the analysis of the churn" bears no direct relation to the chemist's analysis. Reference to the figures given to the previous tables shows, however, that in the case of the cows used, at least, the quality of butter churned bears a very direct relation to the actual quantity of fat in the milk.

(5) *The percentage of cream as a test of quality.* The following table shows that the percentage of cream rises and falls with the increase and decrease of the percentage of fat, taking an average for fourteen days, but not in the same proportion. In other words, there is not a close relation between the percentage of cream and the percentage of fat. This relation varies with different cows, and also with the same cow in different periods. The greatest variation is about 15 per cent; or it takes one-sixth more in volume of cream in one case than it does in another to represent the same amount of fat.

	Belle.			Helen.			Juno.		
	Average per cent of Fat.	Average per cent of Cream.	Parts of Cream for 100 parts of Butter Fat.	Average per cent of Fat.	Average per cent of Cream.	Parts of Cream for 100 parts of Butter Fat.	Average per cent of Fat.	Average per cent of Cream.	Parts of Cream for 100 parts of Butter Fat.
First Period	5.24	24.51	468	4.63	22.79	492	4.81	22.96	477
Second Period	5.84	29.58	507	4.68	23.92	511	4.94	22.47	455
Third Period	5.61	25.77	459	5.20	27.46	524	5.42	25.28	466
Average	....	......	474	....	......	509	....	......	465

In the case of single milkings the variation in the relation of fat and cream volume was still greater, being as much as 25 per cent in some instances. In comparing the weights of butter and volumes of cream the same lack of uniformity in relation is seen.

Taking the weights of milk yielded to represent volumes, multiplying these volumes by the volume percentages of cream, and dividing the results thus obtained by the weights of butter made, we have the relation of butter and cream in the several cases as shown in the table below. The figures are fairly accurate as a means of comparison:

	Volumes of Cream Required for 1 Pound of Butter.		
	Belle.	Helen.	Juno.
First Period	4.45	4.74	4.51
Second Period	5.00	5.21	4.96
Third Period	4.25	5.31	4.62

(6) *Pounds of milk required for one pound of butter.* The next table shows the pounds of milk corresponding to a pound of butter for each cow in each period.

	Pounds of Milk Required to Make One Pound of Butter.		
	Belle.	Helen.	Juno.
First Period	18.17	20.81	19.63
Second Period	16.85	21.79	22.04
Third Period	16.54	19.37	18.24

(7) *The composition of the two rations.* The reason for the marked difference in effect of the two rations compared in this experiment can be seen only by ascertaining the quantities of digestible material furnished to the animals in the two cases. The hay fed was mostly Timothy mixed with some Red Top, being the lot from which was taken the hay used in the third period of the digestion experiments with a sheep, previously described.

The composition of this hay and of samples of the corn meal and cotton-seed meal fed was determined. Knowing the weights of the materials fed, and their composition and digestibility, it is a simple matter to calculate the quantity of digestible matter supplied to the animals by each ration.

For instance, the hay contained 6.25 pounds of protein in 100 pounds of hay, consequently in the 18 pounds of hay fed daily there would be 1.12 pounds of protein. The digestion experiment showed that 42 per cent of this protein was digestible, so that of the 1.12 pounds fed, only .47 pounds would be available for the purposes of nutrition. By a similar calculation the digestible protein in five pounds of corn meal is found, which, added to that of the hay, gives the total digestible protein in a day's ration of hay and corn meal.

Applying this method of calculation throughout, the figures of the following tables are obtained.

DIGESTIBLE MATTER OF PERIODS 1 AND 3.

	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
	lbs.	lbs.	lbs.	lbs.
18 pounds hay	.47	2.86	5.44	.18
3 pounds corn meal	.24	-	1.76	.10
2 pounds cotton-seed meal	.76	-	.32	.28
	1.47	2.86	7.52	.56

DIGESTIBLE MATTER IN PERIOD 2.

	Protein.	Crude Fiber	Nitrogen-free Extractive Matter.	Fats.
18 pounds hay	.47	2.86	5.44	.18
5 pounds corn meal	.40	-	2.93	.17
	.87	2.86	8.37	.35

The important difference in the two rations is now plainly shown. While the total digestible material was almost exactly the same in both cases, the ration fed in Periods 1 and 3 furnished nearly twice as much digestible protein as the ration of Period 2. The latter ration was poor in protein, and as this constituent of cattle foods is the source of a large part of the solid matter of milk, the food of Period 2 was defective for milk production. The deficiency was supplied partially, at least, by the substitution of cotton-seed meal for a portion of the corn meal, the former containing a very high percentage of protein. If the hay fed had been clover instead of Timothy mostly, the deficiency in protein would not have been so great with the corn meal alone, and there is good reason for supposing that the presence of cotton-seed meal in the ration would not have produced so marked an effect. The indiscriminate use of a highly nitrogenous feeding stuff, such as cotton-seed meal, is not likely to result as favorably in all cases as in this experiment.

EXPERIMENT IN FEEDING STEERS FOR GROWTH.

This experiment involved a comparison between hay combined with corn meal, and straw combined with a mixture of corn meal and cotton-seed meal, as food for growing steers.

Result of the experiment. The steers fed oat straw and a mixture of corn meal and cotton-seed meal made the cheaper growth.

One pair of yearlings and one pair of two-year-old steers were used in the experiment. They were all thrifty animals, and were well matched in size and form. Two steers, one from each pair, or one yearling, and one two-year-old, were fed the same kind of ration. The daily rations were in kind and quantity as follows:

Steer 1, yearling, { 12 pounds hay.
3 " corn meal.*

Steer 2, two-year-old, { 16 pounds hay.
4 " corn meal.

Steer 4, yearling, { 12 pounds oat straw.
1½ " corn meal.
1½ " cotton-seed meal.

Steer 3, two-year-old, { 16 pounds oat straw.
2 " corn meal.
2 " cotton-seed meal.

The hay contained no clover, but was a mixture of Timothy and Red Top. The oat straw was of good quality.

Below can be seen the weights of the steers and the beginning and end of the experiment, the figures given being the average of several daily weighings.

	Steer 1.	Steer 2.	Steer 3.	Steer 4.
Weight Jan. 6th, 7th, 8th and 9th....	627½	845	860	701½
Weight May 17th and 19th..........	751½	1007	984½	815
Gain in 132 days	124	162	124½	113½

In estimating the financial results from the two methods of feeding, the following prices have been used in computing the cost of the food:

Hay .... $14.00 per ton.
Oat straw........ 6.00 " "

*One quart of meal weighs 1¾ pounds.

Corn meal	$22.00 per ton	(55 cents for 50 lbs.)
Cotton-seed meal..	30.00 " "	

The prices of these materials would vary with the locality, of course.

A summary of the results of the experiment follows:

	STEERS 1 AND 2. Hay and Corn Meal.	STEERS 3 AND 4. Straw, Corn Meal and Cotton-Seed Meal.
Length of time (days)	132	132
Weight of hay eaten..........	3696 lbs.	
Weight of oat straw eaten.....		3696 lbs.
Weight of corn meal eaten.....	924 "	462 "
Weight of cotton-seed meal eaten,		462 "
Cost of food.................	$36.03	$23.10
Total gain...................	286 lbs.	238 lbs.
Cost for each pound of gain...	12.6 cents.	9.7 cents.

The gain of the two steers eating hay and corn meal was 48 lbs. more than that of the other pair, but owing to the much greater cost of the food in the former case, the gain of the latter was more economical, the expense being 2.9 cents less for each pound of increase in weight.

This difference in cost of growth is due to the difference in the rations fed, provided the two lots of steers would have made the same gain on the same feed. There is no proof that this would have been the case, and the results of this trial should receive corroboration from further experiments before being accepted as pointing to a correct conclusion.

It will not be amiss, however, to inquire into the essential differences in the kind and quantity of nutritive ingredients that the two rations furnished.

The materials fed were not analyzed, but they would not be found to differ essentially from the average composition of similar cattle foods, as determined by American analyses.

	Containing in 100 Parts.					
	Water.	Ash.	Protein.	Crude Fiber.	Extractive Matter.	Fats.
Hay	13.45	4.99	6.66	28.69	44.91	2.10
Oat straw	10.11	4.72	3.35	42.78	36.97	2.07
Corn meal	15.03	1.45	9.09	1.85	68.86	3.72
Cotton-seed meal	8.33	7.25	42.06	5.69	23.43	13.24

The digestibility of these feeding stuffs is assumed to be that found by German experiments, except in the case of the cotton-seed meal, where the average of Armsby and Wolff's determinations are used.

	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
Hay	51	54	58	41
Oat straw	41	60	46	30
Corn meal	79	62	91	85
Cotton-seed meal	87	-	76	95

The figures showing the pounds of digestible matter which the rations furnished to each steer are given in the next table, the method of calculation being the same as that explained in discussing the previous experiment.

	Pounds of Digestible Matter per day and per head.			
	Protein.	Crude Fiber.	Nitrogen-free Extractive Matter.	Fats.
Steer 1—Yearling	.62	1.86	5.00	.19
Steer 2—Two-year-old	.83	2.48	6.67	.26
Steer 3—Two-year-old.	1.09	4.10	4.33	.42
Steer 4—Yearling	.82	3.08	3.25	.13

The real difference in the two rations is seen to be that the ration of straw, corn meal and cotton-seed meal furnished to steers 3 and 4 a little more digestible protein and fat and less digestible crude fiber and nitrogen-free-extractive matter than the ration of hay and corn meal furnished to steers 1 and 2. This difference was not great, however.

Comments upon the relative value of cattle foods, and the compounding of rations.

Attempts have been made at various times to express the value of one cattle food in terms of another. Tables have been published showing that one pound of corn meal is equal to a certain number of pounds of hay, or of oats, or of wheat bran.

Such comparisons are of little service in the practice of cattle feeding. No constant value can be assigned to a cattle food as representing what it will accomplish under any or all circumstances. The profits from the use of any feeding stuff depend upon the conditions under which it is fed, such as the accompanying food, and the kind and purpose of the animal. Some recent experiments, including the one by this Station in feeding corn meal and cotton-seed meal for milk production, have given results that seem to illustrate this truth. Dr. Armsby has conducted two sets of experiments at the Agricultural Experiment Station connected with the Wisconsin State University, having for their object the determination of the relative value of oil meal as compared with corn meal in a ration for milch cows, which seem likely to prove of great value in showing certain limitations in feeding. In 1885 the poorest ration fed to each cow consisted of 15¼ pounds of clover hay and 9 15-16 pounds of corn meal daily, while in 1886 the poorest ration was made up of 8¾ pounds clover ensilage, 17½ pounds mixed hay, 5 pounds wheat bran, and 7 pounds of corn meal. In practice, this would be considered liberal feeding. Dr. Armsby found no evidence in the results of the two experiments that the substitution of oil meal for an equal quantity of corn meal in the above rations, or that the addition of oil meal to these rations, made production any cheaper, or even caused an increase in the yield of milk.

In the Station experiment, when only corn meal was fed for grain, the ration was 18 pounds of Timothy hay and 5 pounds of corn meal. The substitution of two pounds of cotton-seed meal for two pounds of corn meal in this case had a marked effect in increasing production. Why does the outcome of the Station experiment stand in seeming opposition to the results of Dr. Armsby's experiments? Simply because the conditions were different in the two cases.

Cotton-seed meal and oil meal are highly nitrogenous foods, and are especially adapted to supplying protein to a ration. On the other hand, corn meal is not highly nitrogenous, and if cotton-seed meal, which contains over four times as much protein, be substituted for it, a change is made which is favorable to increased production whenever the food is deficient in digestible protein. Such was certainly the case with the ration of Timothy hay and corn meal in the Station experiment, and it is not difficult to see that by substituting cotton seed for corn meal in this case the former food was given a chance to show its peculiar value. In 1885 Dr. Armsby fed Clover hay, which is much more nitrogenous than Timothy, and with this was given almost ten pounds of corn meal daily, or nearly twice that fed in the Station experiment, altogether making a ration that practice would regard as sufficient to sustain an abundant flow of milk. Dr. Armsby used full as heavy rations in 1886, and here, as in the former experiment, the corn meal seemed to do all that the cotton-seed meal could, under the circumstances.

Dr. Armsby's poorest ration contained not only much more digestible protein than the Station ration of Timothy hay and corn meal, but more digestible matter of all kinds, and it is not to be expected that the additional supply of digestible protein in the form of oil meal or cotton-seed meal would have the same effect in the two cases. Granting that the conclusions toward which all these experiments so strongly point are correct, there can be no escaping the conviction that there is a good chance to practice economy in compounding foods so as to produce a properly balanced ration, and at the same time give each food a chance to do its maximum work. For some time the theory has been taught, based upon German investigations, that highly nitrogenous foods like oil meal should be used in connection with feeding stuffs especially poor in nitrogen, and that in this way the minimum amount of food is made to do the maximum amount of work. It remains for the experience of investigators to prove this theory true or false.

LICENSE FEES.

The following is a list of the manufacturers of fertilizers, whose goods are sold in Maine, who hold unexpired licenses:

Bradley Fertilizer Company, Boston, Mass.	
Bradley's X L Superphosphates	$50 00
B D Sea Fowl Guano	15 00
Original Coe's Phosphate	15 00
Bradley's Circle Brand Bone and Potash	15 00
Jas. R. Smith & Emil A. Becker, Buffalo, N. Y.	
Buffalo Ammoniated Superphosphate	50 00
Potato, Hop and Tobacco Phosphate	15 00
Standard Fertilizer Company, Boston, Mass.	
Standard Superphosphate	50 00
Williams, Clark & Company, New York.	
Americus Ammoniated Superphosphate	50 00
Cumberland Bone Company, Portland.	
Cumberland Superphosphate	50 00
Atlantic Fertilizer Company, Boston, Mass.	
Mayo Superphosphate	50 00
Clark's Cove Guano Company, New Bedford, Mass.	
Bay State Fertilizer	50 00
Thoroughbred Farm and Garden Fertilizer	15 00
Sagadahoc Fertilizer Company, Bowdoinham, Me.	
Sagadahoc Superphosphate	50 00
Dirigo Fertilizer	15 00
J. A. Tucker & Company, Boston, Mass.	
Bay State Superphosphate	50 00
Red Beach Plaster Company, Calais, Me.	
Red Beach Superphosphate	50 00

Glidden & Curtis, Boston, Mass.	
Soluble Pacific Guano	$50 00
F. S. Farrar & Company, Bangor, Me.	
Farrar's Superphosphate	50 00
Wilkinson & Company, New York, N. Y.	
Wilkinson's Superphosphate	50 00

Law Establishing the Maine Fertilizer Control and Agricultural Experiment Station.

CHAPTER 294, PUBLIC LAWS OF 1885.

AN ACT to establish an Agricultural Experiment Station.

Be it enacted by the Senate and House of Representatives in Legisture assembled, as follows:

SECTION 1. That for the purpose of protection from frauds in commercial fertilizers, and from adulterations in foods, feeds and seeds, and for the purpose of promoting agriculture by scientific investigation and experiment, the Maine Fertilizer Control and Agricultural Experiment Station is hereby established in connection with the State College of Agriculture and Mechanic Arts.

SECTION 2. The direction and management of this station shall be committed to a board of managers, to consist of five members, namely: the professor of agriculture of the State College of Agri culture and Mechanic Arts, ex-officio; the secretary of the state board of agriculture, ex-officio, and three members to be appointed by the governor, whose terms of office shall be three years, except in the first appointment, one shall be designated to serve but one year, and one to serve two years.

SECTION 3. The board of managers shall be called together by the secretary of the board of agriculture, at such place in this state as he may designate, within thirty days of the approval of this act, for the purpose of transacting such business as may be required to put the station in operation; and thereafter the board of managers shall hold a meeting annually, at Augusta, on the Tuesday preceding the third Wednesday of January, for the transaction of business relating to the station. Other meetings may be called, on due notice, by the president, at such times and places as will best promote the objects contemplated by this act.

SECTION 4. The board of managers shall organize by the election of a president, a secretary and treasurer, who shall severally hold their offices for one year and until their successors are elected. They shall locate the station herein provided for, and shall appoint a director, who shall have the general management and oversight of the analyses, investigations and experiments necessary to carry out the purposes named in section one of this act, and shall employ competent assistants to aid in prosecuting the work of the station. It shall, whenever public interest will be promoted thereby, publish by bulletin or otherwise, the results of its investigations and experiments, and shall make an annual report of its work to the governor and council, which shall be printed and bound with the report of the secretary of the board of agriculture.

SECTION 5. The sum of five thousand dollars, annually, is hereby appropriated to the Maine Fertilizer Control and Agricultural Experiment Station, and the governor and council, from time to time, shall draw their warrant on the state treasurer for such sums of money as are necessary to defray the expenses herein provided for, not exceeding in any one year the appropriation herein named, an account of which shall first be approved by the president and secretary of the board of managers.

SECTION 6. The board of managers shall receive no compensation for time and services rendered, but shall be reimbursed for actual expenses incurred in the performances of their duties.

SECTION 7. Any manufacturer, company, or person who shall offer, sell, or expose for sale in this state, any commercial fertilizer, the price of which exceeds ten dollars per ton, shall affix to every package, in a conspicuous place on the outside thereof, a plainly printed certificate, stating the number of net pounds in the package sold or offered for sale, the name or trade-mark under which the article is sold, the name of the manufacturer, and the place of manufacture, and a chemical analysis stating the percentage of nitrogen, or its equivalent in ammonia in available form, of potash soluble in water, and of phosphoric acid in available form, soluble or reverted, as well as the total phosphoric acid.

SECTION 8. The manufacturer, company, or person selling or offering for sale in this state, any commercial fertilizers exceeding ten dollars per ton in price shall, on or before the first day of April annually, or before offering the same for sale, procure a license from the board of managers, authorizing the sale of said fertilizers in the State, and shall pay for the same the sum of fifty dollars for a single brand, and fifteen dollars for each additional brand offered for sale; and shall furnish the secretary of the board of managers, at the time of their appointment, the names of all agents authorized by him to sell the same in this state.

SECTION 9. This act shall not apply to the article known as porgy chum, or fish scrap, or fish waste of any kind, or bone, when offered for sale unmixed with other fertilizing material; nor shall it apply to parties manufacturing fertilizers in quantities less than twenty-five tons per year, or to fertilizers in possession of dealers or agents at the time of approval of this act.

SECTION 10. The director of the station, or any person by him deputized, is hereby empowered to select from three different parcels or packages of commercial fertilizers, taken from three different sections of the state, held or offered for sale in this state, quantities not exceeding two pounds from each package, which quantities shall be for analysis, the average of the several analyses shall be taken to compare with the certificate found on the given packages, held or offered for sale; and he shall select each year, at least three samples, as aforesaid, from each brand held for sale, and shall secure these analyses at the station. The agent shall select these samples, in the presence of some representative of the company, from which the quantities are so selected, and shall deliver one-half of said samples, properly sealed by him, to said representative.

SECTION 11. The secretary of the board of managers shall register, in a suitable book kept in his office, a list of all licenses issued, and of fees received therefor, and a list of all brands of fertilizers sampled; and all license fees received by the board of managers shall be paid into the treasury of the state.

SECTION 12. Any person or party, who shall offer or expose for sale any commercial fertilizer, without complying with the requirements of sections seven and eight of this act, or shall permit an analysis to be attached to any package of such fertilizer, stating that it contain a larger percentage of any one or more of the constituents named in section seven of this act than it really does contain, shall be fined not less than one hundred dollars nor more than three hundred dollars for the first offense, and not less than two hundred dollars nor more than five hundred dollars for each subsequent offense; and the offender shall, in all cases, also, be liable for damages sustained by the purchasers of said fertilizers, *provided*, *however*, that the deficiency of one per cent of nitrogen, potash, or phosphoric acid claimed to be contained, shall not be considered as evidence of fraudulent intent.

SECTION 13. All acts and parts of acts inconsistent with this act are hereby repealed.

SECTION 14. This act shall take effect when approved.

[Approved March 3, 1885.]

COLLEGE FARM EXPERIMENTS

Conducted at Maine State College Farm to May 1st, 1886,

By G. M. GOWELL, Farm Superintendent.

EXPERIMENT NO. 13—Continued.

The question:—Can profitable crops be grown continuously by use of commercial fertilizers, but without aid from animal manure?—presses itself forward for examination.

A field of five and one-half acres of uniform clay loam soil, underlaid by compact clay subsoil, offered opportunities for this experiment upon plots sufficiently large to show their products and costs, in actual field culture.

Previous to 1882, this field had been in grass many years, and was much reduced in fertility. It was used in 1882 and 1883 as a fertilizer test field, with the plots running in an opposite direction to those of the present plan, and cropped with beans each year.

In 1884, it was divided into nine plots, each one of which contained one-half acre or more, and received the kind and quantity of fertilizing material as indicated in the accompanying plan. The field was sown to barley, using two and one-half bushels of seed per acre, and seeded to Timothy and Red Clover.

The grass seed came up finely but was badly killed by the drouth of August and the severe freezing of the following fall and spring. In March last, Timothy and clover were again sown upon the surface, and at this date, November, the entire field is covered with well-established Timothy and clover plants.

This young grass was not sufficiently advanced to add much to the crop of hay harvested in July, which cannot be regarded as indicating the fertility of the soil of the different plots, as much more of the grass was killed on some plots than on others. The hay was quite clean Timothy and of good length.

Probably the appearance of the plots at the present time, when all are evenly set in grass, is a better indication of their state of fertility than either the grain or grass crops harvested are.

Plot No. 2 (ashes) has quite a good growth of clover after-math.
Plot No. 7 (potash) has a very fair second crop of clover upon it.
Plots 2 and 7 show much more clover than other plots do.

Plot No. 8 (ammonia) is, and has been throughout the season, deeper in color than any other plots, but has very little clover upon it.

There is some difference in the appearance of the other plots, but it is not so marked as in those indicated.

PLOT.	FERTILIZER PER ACRE IN 1884.	Cost of Fertilizer per Acre in 1884.	Yield of Barley per Acre in 1884.	Yield of Hay per Acre in 1885.
No. 1.	Bradley's X. L. Superphosphate, 500 lbs.	$10.00	37 bush.	2316 lbs.
No. 2.	Unleached Ashes from mixed wood, 75 bushels.	15.00	38.8 "	3520 "
No. 3.	Rockland Lime, 12 casks.	12.50	22.5 "	2288 "
No. 4.	Raw Bone, 500 lbs.	9.50	27.8 "	1185 "
No. 5.	Dissolved Bone, 500 lbs.	10.00	25.2 "	2275 "
No. 6.	Nothing.	-	22.5 "	2352 "
No. 7.	Muriate of Potash, 200 lbs.	5.00	31.5 "	2208 "
No. 8.	Sulphate of Ammonia, 200 lbs.	9.00	18 "	2828 "
No. 9.	Bradley's X. L. Superphosphate, 500 lbs.	10.00	38.2 "	2336 "

No fertilizers were applied in 1885.

Each plot will be supplied as often as is thought necessary with the same kind of fertilizing material that it has already received.

The experiment offers opportunities for the study of other questions besides the leading one.

First: The comparison of raw bone with dissolved bone.

Second: Are the results of ashes upon this soil to be attributed to the lime, or potash which they contain? The products from the lime plot and the potash plot must settle this point.

Third: What will be the plant-producing capacity of the unmanured plot, after a series of years? or, will a clay soil become entirely exhausted of its fertility when subjected to thorough mechanical working, and crop rotation?

Experiment No. 16.

Oat Seeding.

A tract of somewhat worn grass land—soil, clay loam—was plowed in November, 1884, and in May, 1885, prepared for seeding to oats, by thorough pulverization and an application of five hundred pounds of superphosphate per acre.

Five uniform plots, each containing one-twentieth of an acre, were sown with varying quantities of seed. Upon five other plots of like areas and conditions the work was repeated. The accompanying table shows the results.

	Seed per Acre.	Yield per Acre.
Plot No. 1	2 bushels.	56.3 bushels.
" 2	4 "	58.6 "
" 3	6 "	63.4 "
" 4	8 "	56 "
" 5	10 "	55.7 "
" 6	2 "	56.6 "
" 7	4 "	66 "
" 8	6 "	67.3 "
" 9	8 "	69.4 "
" 10	10 "	55.6 "

Experiment No. 17.

Beef Production.

The importance of many phases of the subject of beef production, among which are early and late maturity, cost at different ages, amounts of food required to produce growth during the monthly periods from birth to maturity, and others, seemed to require practical illustration here upon the farm, and this experiment is intended for that purpose.

The conditions under which it is conducted are somewhat different from those which govern beef production on most farms, and shows the raising of steers by stall-feeding throughout their whole lives, without material aid from pasturage. It is not intended in any way to compare the economy of the two processes of stall-feeding and pasturage. Many farms have not the advantage of cheap lands for pastures, and necessarily stall-feeding is resorted to. This applies to the management of our dairy cows here, where they receive most of their food from their stalls each day, and also to the heifer grown from calfhood to places in the dairy herd.

Two full-blood Shorthorn bull calves: "Berry," calved September 25, 1884, weighing sixty-five pounds, and "Bright," calved December 2, 1884, weighing seventy-five pounds at birth, were taken from their dams at two days of age, and fed new milk until their digestive powers were sufficiently strong to take skimmed milk.

Berry scoured very badly for several weeks, notwithstanding very light rations, which accounts for the protracted use of new milk in his case. They were fed separately from each other, and in uniform periods of thirty days each.

The food for each animal was weighed, and much care exercised to prevent waste. At no time were they over-fed.

The milk was given in equal parts, morning and night; the grain was fed dry twice daily, and the hay in three equal feeds per day. All feeding was done in the barn.

They were given an hour or two in the open yard daily, when the weather would admit, and from July to October, inclusive, they had access to a small pasture run that was fed down closely by other stock. The amount of food obtained in this pasture can only be estimated. This is unfortunate, but there is no bare run on the farm, of sufficient size to give them an opportunity for the exercise required for full development.

During September and October, both animals were badly worried by flies, which partially explains the cause of the low gain made by each animal during these periods.

BERRY.

FIRST MONTH—October.			
Weight, 89 lbs. Gain, 24 lbs.			
Feed—New milk	130 lbs.	$2 27	
Cost of each pound of growth, 9.45 cents.			
SECOND MONTH—November.			
Weight 131 lbs. Gain, 42 lbs.			
Feed—New milk	310 lbs.	5 43	
Cost of each pound of growth, 12.92 cents.			
THIRD MONTH—December.			
Weight, 177 lbs. Gain, 46 lbs.			
Feed—New milk	400 lbs.	7 00	
Hay	10 "	06	
Cost of each pound of growth, 15.34 cents.			$7 06
FOURTH MONTH—January.			
Weight, 237 lbs. Gain, 60 lbs.			
Feed—New milk	150 lbs.	2 62	
Skimmed milk	300 "	75	
Barley meal	45 "	51	
Hay	22 "	13	
Cost of each pound of growth, 6.68 cents.			4 01
Castrated during this period.			
FIFTH MONTH—February.			
Weight, 295 lbs. Gain, 58 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Barley meal	68 "	76	
Hay	48 "	28	
Cost of each pound of growth, 4.37 cents.			2 54
SIXTH MONTH—March.			
Weight, 335 lbs. Gain, 40 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	72 "	81	
Cotton-seed meal	26 "	39	
Hay	62 "	37	
Cost of each pound of growth, 7.67 cents.			3 07
SEVENTH MONTH—April.			
Weight, 413 lbs. Gain, 78 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	80 "	1 01	
Cotton-seed meal	45 "	67	
Hay	90 "	54	
Cost of each pound of growth, 4.76 cents.			3 72

EIGHTH MONTH—May.			
Weight, 472 lbs Gain, 59 lbs.			
Feed—Skimmed milk	600 lbs.	$1 50	
Bran	87 "	98	
Cotton-seed meal	51 "	76	
Hay	125 "	75	
Cost of each pound of growth, 6.76 cents.			$3 99
NINTH MONTH—June.			
Weight, 540 lbs. Gain, 68 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	60 "	68	
Barley meal	35 "	39	
Cotton-seed meal	50 "	75	
Hay	240 "	1 44	
Cost for each pound of growth, 7 cents.			4 76
TENTH MONTH—July.			
Weight, 599 lbs. Gain, 59 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	68 "	77	
Cotton-seed meal	50 "	75	
Hay	150 "	90	
Cost of each pound of growth, 6.64 cents.			3 92
ELEVENTH MONTH—August.			
Weight, 663 lbs. Gain, 64 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	70 "	79	
Cotton-seed meal	50 "	75	
Hay	140 "	84	
Cost of each pound of growth, 6.06 cents.			3 88
TWELFTH MONTH—September.			
Weight, 708 lbs. Gain, 45 lbs.			
Feed—Skimmed milk	300 lbs.	75	
Bran	80 "	90	
Cotton-seed meal	54 "	81	
Hay	121 "	73	
Cost of each pound of growth, 7.08 cents.			3 19
THIRTEENTH MONTH—October.			
Weight, 735 lbs. Gain, 27 lbs.			
Feed—Skimmed milk	300 lbs.	75	
Bran	89 "	1 00	
Cotton-seed meal	54 "	81	
Hay	239 "	1 43	
Cost of each pound of gain, 14.77 cents.			3 99
FOURTEENTH MONTH—November.			
Weight, 779 lbs. Gain, 44 lbs.			
Feed—Bran	82 lbs.	92	
Cotton-seed meal	14 "	21	
Linseed meal	27 "	51	
Hay	278 "	1 66	
Cost of each pound of gain, 7.04 cents.			3 30

During the first fourteen months of his life, "Berry" ate food to the value of $55.08, and gained in weight 714 pounds, making the gain cost 7.71 cents per pound.

BRIGHT.

HALF MONTH.			
Weight, 97 lbs. Gain, 22 lbs.			
Feed—New milk	144 lbs.	$2 52	
Cost of each pound of growth, 11.45 cents.			
FIRST MONTH—January.			
Weight, 143 lbs. Gain, 46 lbs.			
Feed—New milk	210 lbs.	3 67	
Skimmed milk	210 "	52	
Cost of each pound of growth, 9.1 cents.			$4 19
Castrated during this period.			
SECOND MONTH—February.			
Weight, 200 lbs. Gain, 57 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Barley meal	24 "	27	
Cost of each pound of growth, 3.1 cents.			1 77
THIRD MONTH—March.			
Weight, 160 lbs. Gain, 60 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	36 "	40	
Cotton-seed meal	22 "	33	
Hay	21 "	12	
Cost of each pound of growth, 3.91 cents.			2 35
FOURTH MONTH—April.			
Weight, 317 lbs. Gain, 57 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	52 "	58	
Cotton-seed meal	45 "	68	
Hay	52 "	31	
Cost of each pound of growth, 5.38 cents.			3 07
FIFTH MONTH—May.			
Weight, 372 lbs. Gain, 55 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	82 "	92	
Cotton-seed meal	50 "	75	
Hay	85 "	51	
Cost of each pound of growth, 6.69 cents.			3 68
SIXTH MONTH—June.			
Weight, 455 lbs. Gain, 83 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	61 "	68	
Barley meal	35 "	39	
Cotton-seed meal	50 "	75	
Hay	125 "	75	
Cost of each pound of growth, 4.9 cents.			4 07

SEVENTH MONTH—July.			
Weight, 514 lbs. Gain, 59 lbs.			
Feed—Skimmed milk	600 lbs.	$1 50	
Bran	68 "	74	
Cotton-seed meal	50 "	75	
Hay	100 "	60	
Cost of each pound of growth, 6.08 cents.			$3 59
EIGHTH MONTH—August.			
Weight, 603 lbs. Gain, 89 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	70 "	79	
Cotton-seed meal	50 "	75	
Hay	88 "	52	
Cost of each pound of growth, 4 cents.			3 56
NINTH MONTH—September.			
Weight, 635 lbs. Gain, 35 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	70 "	79	
Cotton-seed meal	54 "	81	
Hay	87 "	53	
Cost of each pound of growth, 10.37 cents.			3 63
TENTH MONTH—October.			
Weight, 662 lbs. Gain, 24 lbs.			
Feed—Skimmed milk	600 lbs.	1 50	
Bran	90 "	1 01	
Cotton-seed meal	52 "	78	
Hay	135 "	81	
Cost of each pound of growth, 17.08 cents.			4 10
ELEVENTH MONTH—November.			
Weight, 725 lbs. Gain, 63 lbs.			
Feed—Skimmed milk	300 lbs.	75	
Bran	84 "	95	
Cotton-seed meal	14 "	21	
Linseed meal	28 "	53	
Hay	233 "	1 40	
Cost of each pound of growth, 6.06 cents.			3 84

This steer increased in weight during the first eleven and one-half months of his life, 650 pounds. The cost of the food required to produce this growth was $40.37. Cost of growth per pound, 6.21 cents.

Maine State Pomological Society.

ANNUAL EXHIBITION.

The thirteenth annual exhibition of the Maine State Pomological Society was held at Lewiston, September 21, 22, 23, 24 and 25, 1885, in connection with that of the Maine State Agricultural Society, as in previous years. But while held on the same days, the details of the exhibition in every respect were under exclusive direction of the officers of the Pomological Society; and while the exhibition formed a part of the great whole, it was an important part and contributed largely to the general success. One-half of the third floor of the large exhibition hall on the State Park was devoted to the various displays of the Society, and the room proved entirely inadequate to properly arrange the large exhibits. Had the whole floor been placed at the disposal of the Society it would have been none too much for the wants of the exhibition. As it was, eighteen large tables were devoted to fruits, and eight racks to the various exhibits of cut flowers, while placed about the tables were vases and bouquets of various designs which helped to give a most attractive and artistic appearance to the tables. In consequence of the large number of plates and the small amount of table space, it was quite impossible to arrange the collection in so systematic a manner as has been done at some previous exhibitions, consequently the whole display lost somewhat in completeness, harmony, and the ease with which it could be studied. Indeed, after many of the tables had been arranged, it was necessary to remove the fruit from several of the tables, rearrange the same in order to obtain more room, provide additional accommodations, and this, too, while the exhibition was in progress. Six extra tables of large size were placed in the floor which was last year used as a public alley or court in the centre of the building, and although this crowded the visitors into a narrower space than was agreeable, it was found necessary in order to make accommodations for the unexpectedly large display.

The excellent system of classification and arrangement of fruit adopted by the Society years ago was carried out in this late fair, so far as was possible with the limited space at command—county exhibits, single varieties, and other collective exhibits by themselves. First in the list of collections was that showing the best general State collection grown by the exhibitor. For this display the Society has been wisely reducing the number of varieties to be embraced in the collection, and this year adopted twenty as the standard of admission, hoping by this means to discourage the multiplication of varieties, and prevent the exhibition of collections running up to one hundred varieties, and above, such as have frequently been noticed at previous exhibitions, in which would be likely to be found scores of varieties of little value. In this class were fourteen entries.

In the class for county collections there was a magnificent display, eleven counties being represented, the competitors numbering thirty-seven. Most of these exhibits were exceptionally fine in quality and character. An interesting competitive exhibit was that for the Society's prizes for the best five varieties of autumn apples, and the best five varieties winter apples. In the former list were twenty-one and in the latter list twenty-two exhibitors. In the class for the prize offered for the "best collection of apples for home use for the entire year, in the smallest number of varieties," were twelve competitors; and in the collection of crab apples, nine competitors.

In the Society's list were premiums for the "best plate of from five to ten specimens each, according to their size," for fifty-four different varieties of our most celebrated fall and winter apples. In this class were eighty-eight different exhibitors, showing from one to thirty varieties each, and a most gorgeous sight it was when these plates had been arranged on tables by themselves for examination by the committee. More than a day was given to the work of examination, and so far as could be learned their judgment was unquestioned and met the approval of the different competitors. In a matter involving so much labor and so nice a degree of judgment, this is certainly a high compliment to the ability of the judges.

In the division embracing pears there was a truly magnificent display, and the value of the several collections was increased by the fact that the larger exhibits were correctly named—a matter of great value and interest to those who wished to study them for the purpose of becoming *posted*. In the prize for the "best general exhibition" there were seventeen entries, the several exhibitors showing from five to thirty-four varieties. The Society's list embraces premiums for twenty-eight varieties, but those shown outnumbered the list by nearly one-half, forty-nine varieties being on the tables. Clapp's Favorite led with twenty plates, followed by Sheldon with nineteen, Flemish Beauty with seventeen, Bartlett with fifteen, Beurre d'Anjou and Louise Bonne De Jersey with twelve each, Howell with eleven, and the other sorts with from one to eight. Our Maine pears were represented as follows: Fulton, one plate; Nickerson and Goodale four each. The display of open-air, cold-grapery, and fire-heat grapes was large and fine.

There were twenty-four exhibitors of plums, and eight of cranberries. The display of canned and preserved fruits was the largest ever shown in the history of the Society.

In flowers and floral designs the exhibition was interesting, but not as large as at some previous fairs, there being no pot plants (Class VI, second division,) on display. Six entries were made for collections of cut flowers, of one hundred phials or more each. The show of single varieties was a choice one, but confined to a much less number of varieties than formerly. The floral designs were greatly admired for their unique character and exquisite arrangement of colors. The general rules of the exhibition, together with the premiums awarded in the several classes are given below; but it has been deemed unnecessary to publish the names of fruit or articles for which no entries were made, and to omit altogether the consecutive numbering of the several paragraphs as in the premium list:

GENERAL RULES OF THE EXHIBITION.

1. The general regulations of the Joint Exhibition will govern this department, as far as applicable thereto, and except as herein otherwise provided.

2. Entries may be made at the office of the Secretary, in Augusta, personally, or by letter, until September 17th, and after that at the Park, on the first day of the exhibition, until 4 o'clock P. M.

3. Exhibitors are requested to present full and accurate lists of the varieties of fruit or other articles to be entered; and to specify the premium for which each article is entered; also to affix their names and P. O. addresses, so that the same may be correctly trans-

ferred to the books and exhibition cards. Persons intending to make entries will confer a special favor by sending lists of the same to the Secretary at an early day.

4. All fruits and flowers offered for premiums must have been grown by the exhibitor; and any violation of this rule will debar or forfeit the premium. Specimens offered for *exhibition only*, by others than the growers, must in all cases have the name of the grower affixed, if known.

5. All fruits and flowers exhibited must, as far as possible, be correctly named according to the standard nomenclature adopted by the Society, and it be the duty of the standing committee of the Society to examine labels and correct all errors in nomenclature during the exhibition.

6. Where a certain number of specimens or varieties, or a definite quantity of any article, is required by the schedule, exhibitors should conform to such requirement; and larger quantities will not be admitted except by special arrangement with the Executive Committee, having reference to economy of space and the symmetry of the exhibition.

7. Dishes and labels for the exhibition of fruits, and phials and stands for cut flowers, will be furnished by the Society, and no others will be admissible. No premium will be paid on any article which is accompanied by an advertisement or business card.

8. Exhibitors must see to the delivery of their contributions, and will be required to put them *in the places designated for them*. After the articles are arranged they will be under the exclusive charge of the Society, and the owners will not have liberty to remove them until the exhibition is closed. All reasonable precautions will be taken for the safe keeping of articles on exhibiton, after their arrival and arrangement upon the tables; but the Society will not be responsible for any loss or damage that may occur.

9. No premium will be awarded merely for want of competition, nor unless the article exhibited is worthy of it; and the committees are authorized to withhold the first and award the second or any subsequent premium, or none, at their discretion, according to merit. They are also to withhold all premiums from any articles not exhibited according to the rules, or where any unfair practice has been attempted by the exhibitor.

10. The committees are authorized to recommend gratuities for any new or rare fruits, flowers, plants, or articles of merit for which no premiums have been offered.

11. When a specimen is presented for identification, the exhibitor shall communicate all the information he possesses as to the origin and the local appellation.

12. No member of any of the committees for awarding premiums shall, in any case, vote or decide respecting an award for which such member may be a competitor, or therein have an interest; but in such case such member shall temporarily vacate his place upon the committee.

13. All premiums awarded will be payable by the Treasurer in sixty days after the close of the exhibition, *subject, however, to the following conditions and limitations*, viz:

1st—The Society guarantees to pay premiums and gratuities to the amount of $500, but reserves the right, if more than that amount is awarded, to make such a *pro rata* reduction as will reduce the whole amount payable to that sum.

2d—All premiums not applied for before the first day of January next shall revert to the Society.

3d—The Society's premiums are open for competition to all persons residing in the State; but when premiums and gratuities exceeding $1.00 and less than $20.00 are awarded to a person not a member of the Society, the fee for membership will be deducted therefrom; and when premiums and gratuities amounting to $20.00 or more are awarded to any person not a life member of the Society, the fee for life membership will be deducted thereform; and in either case certificates of membership will be issued accordingly.

LIST OF PREMIUMS AWARDED.

Class I—APPLES.

FIRST DIVISION.

Special Regulations. Entries for all premiums in this division must consist of five specimens of each variety exhibited, and (except Nos. 18 and 19) of at least twenty correctly-named varieties. Entries for pemiums Nos. 18 and 19 must be separate and distinct collections, not embracing any other collection or specimens, and in awarding the premiums regard will be had both to the quality of the specimens and the value of the varieties exhibited.

By "named varieties" is meant such as are named and described in some standard work on Pomology, or have been named and approved by some National or State Horticultural Society.

In adopting 20 as the number of varieties required in county collections, the Society does not intend to encourage the multiplication of varieties; and the committee will be instructed, in awarding the premiums, to have regard to *quality* and *value* rather than to the number of varieties, and will be authorized to recommend gratuities for meritorious collections embracing less than the number of varieties required as above.

Collections entered in this division for the county premiums were allowed to be entered for the general competition under premium No. 1; but it was provided that no more than one premium should be awarded to any collection.

For the best general exhibition of apples grown by the exhibitor in any part of the State. Miss L. L. Taylor, Lakeside, \$15.00; D. J. Briggs, South Turner, \$10.00; L. H. Blossom, Turner, \$5.00.

For the best general exhibition of apples grown by the exhibitor in Cumberland County. S. R. Sweetser, Cumberland Center, \$10.00;

Milton Dyer, Cape Elizabeth, $8.00 ; T. M. Merrill, New Gloucester, $5.00.

For the same in Franklin County. G. K. Staples, Temple, $10.00.

For the same in Kennebec County. W. R. Wharff, Gardiner, $10.00 ; Perley & Perkins, Seward's, $8.00 ; E. A. Lapham, Pittston, $5.00.

For the same in Knox County. Elmas Hoffses, Waldoboro', $10.00.

For the same in Lincoln County. E. W. Dunbar, Damariscotta, $10.00 ; H. J. A. Simmons, Waldoboro', $8.00 ; Geo. B. Sawyer, Wiscasset, $5.00.

For the same in Oxford County. C. H. George, Hebron, $10.00 ; J. J. Towle, Dixfield, $8.00.

For the same in Penobscot County. Henry W. Brown, Newburg, $10.00 ; E. H. Kenniston, Simpson's Corner, $8.00 ; L. I. Bickford, Dixmont Center, $5.00.

For the same in Sagadahoc County. Fred Wright, Bath, $10.00 ; H. S. Cary, Topsham, $8 00.

For the same in Somerset County. J. S. Hoxie, Fairfield, $10.00 ; Frank E. Nowell, North Fairfield, $8.00 ; C. D. Holbrook, North Madison, $5.00.

For the same in Waldo County. Mrs. A. B. Strattard, Monroe, $5.00.

For the same in Androscoggin County. John Dunton, Lewiston, $10.00 ; G. W. Blossom, Turner, $8.00 ; N. W. Harris, Auburn, $5.00.

Best five Autumn Apples. Hayden Bigelow, Greene, $3.00 ; S. R. Sweetser, Cumberland Center, $2.00 ; F. E Nowell, Fairfield, $1.00.

Best five Winter Apples. S. R. Sweetser, Cumberland Center, $3.00 ; E. K. Whitney, Harrison, $2 00 ; F. E. Nowell, Fairfield, $1.00 ;

Best for Home Use. S. W. Shaw, Auburn, $5.00 ; S. R. Sweetser, Cumberland Center, 2.00 ; H. J. A. Simmons, Waldoboro', $3.00.

Best Crab Apples. J. S. Hoxie, Fairfield, $1.00 ; C. D. Holbrook, North Madison, 50c.

SECOND DIVISION.

Entries for premiums in this division must consist of from five to ten specimens, according to size, of each variety exhibited, and must be separate specimens from any exhibited in the first division.

Bell's Early. Henry T. Brown, Newburg, 50c.
Black Oxford. " " " $1.00.
Orange Sweet. " " " 50c.
Red Astrachan. " " " 50c.
Hyslop Crab. John Ladd, Anson, 50c.
Rhode Island Greening. T. M. Lombard, Auburn, $1.00.
Transcendent Crab. " " " 50c.
President. L. H. Blossom, Turner, 50c.
Roxbury Russet. D. W. Pulsifer, Turner, $1.00.
Stark. L. H. Blossom, Turner, $1.00.
Tetofsky. L. H. Blossom, Turner, 50c.
Briggs' Auburn. Miss L. L. Taylor, Lakeside, 50c.
Fall Harvey. " " " " 50c.
Franklin Sweet. " " " " $1.00.
King of Tompkins. " " " " $1.00.
Moses Wood. " " " " 50c.
Mother. " " " " 50c.
Northern Spy. " " " " 50c.
Rhode Island Greening. Miss L. L. Taylor, Lakeside, 50c.
Somerset. Miss L. L. Taylor, Lakeside, 50c.
Williams' Favorite. Miss L. L. Taylor, Lakeside, $1.00.
Winthrop Greening. " " " " 50c.
Orange Sweet. J. S. Hoxie, Fairfield, $1.00.
Peck's Pleasant. " " " 50c.
Tetofsky. " " " $1.00.
Black Oxford. C. A. Day, Turner, 50c.
Yellow Bellflower. E. H. Kenniston, Simpson's Corner, 50c.
Moses Wood. W. R. Wharff, Gardiner, $1.00.
Red Canada. Nelson Ham, Lewiston, 50c.
Grimes' Golden. E. A. Lapham, Pittston, $1.00.
Talman's Sweet. " " " 50c.
Wagener. N. W. Harris, Auburn, 50c.
Hyslop. Horace C. Little, Lewiston, 50c.
Benoni. Henry S. Carey, Topsham, $1.00.
Gravenstein. A. B. Chipman, West Gloucester, 50c.

Roxbury Russet. A. B. Chipman, West Gloucester, 50c.
Franklin Sweet. Perley & Perkins, Seward's, 50c.
Garden Royal. " " $1.00.
Hightop Sweet. " " $1.00.
Large Yellow Bough. " " 50c.
Starkey. Perley & Perkins, Seward's, $1.00.
Primate. " " $1.00.
Hubbardston Nonsuch. David Farrar, Lewiston, 50c.
Duchess of Oldenburgh. I. T. Waterman, East Auburn, $1.00.
Fameuse. I. T. Waterman, East Auburn, $1.00.
Gravenstein. I. T. Waterman, East Auburn, $1.00.
Baldwin. " " " 50c
Briggs' Auburn. I. T. Waterman, East Auburn, $1.00.
Benoni. Frank E. Nowell, Fairfield, 50c.
Hightop Sweet. Frank E. Nowell, Fairfield, 50c.
Porter. Frank E. Nowell, Fairfield, $1.00.
Wagener. " " " $1.00.
Winthrop Greening. Frank E. Nowell, Fairfield, $1.00.
Nodhead. O. B. Cheney, Lewiston, 50c.
Baldwin. S. P. Robie, Auburn, $1.00.
Red Russet. S. L. Farwell, Cumberland Center, $1.00.
Hubbardston Nonsuch, D. B. Wilson, " $1.00.
Williams' Favorite. G. D. Sweetser, " 50c.
Duchess of Oldenburgh. S. R. Sweetser, Cumberland Center, 50c.
Nodhead. S. R. Sweetser, Cumberland Center, $1.00.
King of Tompkins. S. R. Sweetser, Cumberland Center, 50c.
Somerset. S. R. Sweetser, Cumberland Center, $1.00.
Mother. " " " $1.00.
Early Harvest. H. J. A. Simmons, Waldoboro', 50c.
Starkey. Geo. B. Sawyer, Wiscasset, 50c.
Sweet Bough. D. House, North Turner, $1.00.
Northern Spy. R. H. Gardiner, Gardiner, $1.00.
Red Canada. " " " $1.00.
Yellow Bellflower. R. H. Gardiner, Gardiner, $1.00.
President. B. E. Allen, North Greene, $1.00.
Rolfe. B. E. Allen, North Greene, $1.00.
Blue Pearmain. C. H. George, Hebron, $1.00.
Harvey Greening. " " " $1.00.
Peck's Pleasant. L. K. Litchfield, Winthrop, $1 00.
Fameuse. D. H. Knowlton, Farmington, 50c.

Alexander. H. A. B. Hyes, Industry, $1 00.
Wealthy. C. Moody, North Farmington, 50c.
Deane. P. Whittier, Chesterville, 50c.
Blue Pearmain. J. J. Towle, Dixfield, 50c.
Garden Royal. " " " 50c.
Talman's Sweet. " " " $1.00.
Alexander. M. C. Hobbs, West Farmington, 50c.
Sops of Wine. M. P. Tufts, Farmington, $1.00.
King Sweeting. " " " 50c.
Deane. " " " $1.00.
Unknown (for Gratuity). E. F. Purington, Wilton.
Red Astrachan. M. S. Kelley, Phillips, $1.00.
Early Harvest. " " " $1.00.
King Sweeting. John S. Gay, Farmington, $1 00.
Wealthy. C, D. Holbrook, North Madison, $1.00.
Porter. D. W. Pulsifer, East Poland, 50c.
Pumpkin Sweet. H. G. Fairbanks, Monmouth, $1.00.
Pumpkin Sweet. Mrs. L. S. Killings, Lewiston, 50c.

Class II—PEARS.

For best general exhibition of Pears. Samuel Rolfe, Portland, $12.00; L. J. Perkins, Portland, $8.00; J. L. Bickford, Dixmont, $5.00; G. B. Sawyer, Wiscasset, $3.00.

For best five named varieties of Autumn Pears. A. J. Hersom, $3.00; Nelson Ham, Lewiston, $2.00.

For best single variety of Autumn Pears. H. T. Leech, $2.00; S. E. Leech, $1.00.

For best single variety of Winter Pears. L. J. Perkins, $2.00; D. P. True, $1.00.

For the best dish of Bartlett. L. M. Berry, Winthrop, $1.00; A. G. Thurlow, New Gloucester, 50c.

Belle Lucrative. J. S. Hoxie, Fairfield, $1.00; E. K. Whitney, Harrison, 50c.

Buffum. C. J. Perley, Vassalboro', $1.00; L. M. Berry, Winthrop, 50c.

Beurre d' Anjou. A. J. Hersom, Brunswick, $1.00; E. L. Mitchell, Lewiston, 50c.

Beurre Bosc. A. S. Sawyer, Cape Elizabeth, $1.00.

Beurre Hardy. R. H. Gardiner, Gardiner, $1.00.

Beurre Superfin. D. P. True, $1.00.

Beurre Clairgeau. G. B. Sawyer, $1.00; D. J. Briggs, 50c.

Beurre Diel. D. J. Briggs, $1.00; George Hunter, Strong, 50c.

Clapp's Favorite. A. G. Cates, Auburn, $1.00; L. J. Perkins, 50c.

Doyenne Boussock. L. J. Perkins, $1.00.

Duchesse d' Angouleme. S. W. Cook, Lewiston, $1.00; A. J. Hersom, 50c.

Flemish Beauty. E. K. Whitney, $1.00; H. T. Leech, 50c.

Fulton. L. J. Perkins, $1.00.

Glout Morceau. L. K. Litchfield, Winthrop, $1.00; S. E. Leech, 50c.

Goodale. C. J. Perley, $1.00; Miss L. L. Taylor, Lakeside, 50c.

Howell. E. L. Mitchell, $1.00; R. H. Gardiner 50c.

Lawrence. C. H. George. Hebron, $1.00; D. P. True, 50c.

Louise Bonne de Jersey. D. P. True, $1.00; E. L. Mitchell, 50c.

Nickerson. Miss L. L. Taylor, $1.00; S. W. Shaw, Auburn, 50c.

Seckel. John Goss, Auburn, $1.00; D. J. Briggs, 50c.

Sheldon. S. W. Cook, $1.00; John Dunton, New Gloucester, 50c.

Swan's Orange. L. M. Berry, $1.00.

Vicar of Winkfield. S. W. Cook, $1.00; D. P. True, 50c.

Winter Nelis. R. H. Gardiner, $1.00.

Class III—GRAPES.

For best exhibition of grapes grown with artificial heat. J. C. Baker, Lewiston, 1st, $8.00; John Vickery, Auburn, 2d, $5.00.

For best exhibition of grapes grown in cold grapery. Geo. B. Sawyer, Wiscasset, 1st, $8.00.

For best cluster Black Hamburgh. Geo. B. Sawyer, 1st, $1.00; John C. Baker, 2d, 50c.

White Muscat. G. B. Sawyer, 1st, $1.00; J. C. Baker, 2d, 50c.

Muscat Hamburgh. J. C. Baker, 1st, $1.00.

White Chasselas. G. B. Sawyer, 1st, $1.00; J. C. Baker, 2d, 50c.

Lady Downes. J. C. Baker, 1st, $1.00.

Buckland Sweet Water. J. C. Baker, 1st, $1.00; Geo. B. Sawyer, 2d, 50c.

Red Chasselas. J. C. Baker, 1st, $1.00; G. B. Sawyer, 2d, 50c.

For best exhibition of grapes grown in open air. J. S. Hoxie, North Fairfield, 1st, $5.00; D. P. True, Leeds Center, 2d, $3.00.

For best single variety grown in open air. Charles I. Perley, Seward's Mills, (Champion) 1st, $2.00; J. S. Hoxie, North Fairfield (Delaware), 2d, $1.00.

For 3 bunches Delaware. E. K. Whitney, Harrison, 1st, $1.00; Silas M. Wing, Phillips, 2d, 50c.

Concord. E. K. Whitney, Harrison, 1st, $1.00; W. R. Wharff, Gardiner, 2d, 50c.

Hartford Prolific. S. P. Robie, Auburn, 1st, $1.00; E. K. Whitney, 2d, 50c.

Rebecca. E. K. Whitney, 1st, $1.00.

Massasoit. J. S. Hoxie, 1st, $1.00.

Salem. E. K. Whitney, 1st, $1.00.

Worden. J. S. Hoxie, 1st, $1.00.

Brighton. E. K. Whitney, 2d, 50c.

Moore's Early. J. S. Hoxie, 1st, $1.00; E. K. Whitney, 2d, 50c.

Class IV—PLUMS.

For best general exhibition of plums, not less than ten varieties. John Dunton, Lewiston, 1st, $8.00; Elijah Low, Bangor, 2d, $5.00.

For best dish of plums of a single variety. Moses Crafts, Auburn, (Red Magnum Bonum) 1st, $2.00; E. W. Dunbar, Damariscotta, (Niagara), 2d, $1.00.

For best dish Green Gage. E. W. Dunbar, Damariscotta, 1st, $1.00; Frank E. Nowell, Fairfield, 2d, 50c.

Purple Gage. Nelson Ham, Lewiston, 1st, $1.00; J. S. Hoxie, North Fairfield, 2d, 50c.

Yellow Gage. Moses Crafts, Auburn, 1st, $1.00; Frank E. Nowell, Fairfield, 2d, 50c.

Prince's Imperial Gage. E. W. Dunbar, Damariscotta, 1st, $1.00; H. J. A. Simmons, Waldoboro', 2d, 50c.

General Hand. Frank E. Nowell, Fairfield, 1st, $1.00.

Lawrence. J. S. Hoxie, North Fairfield, 1st, $1.00.

Mooer's Arctic. J. S. Hoxie, North Fairfield, 1st, $1.00.

McLaughlin. E. W. Dunbar, Damariscotta, 1st, $1.00.

Bavay's Green Gage. George B. Sawyer, Wiscasset, 1st, $1.00; Nelson Ham, Lewiston, 2d, 50c.

Lombard. G. B. Sawyer, Wiscasset, 1st, $1.00; Moses Crafts, Auburn, 2d, 50c.

Magnum Bonum (Red). M. P. Hawkins, 1st, $1.00; G. B. Sawyer, 2d, 50c.

Smith's Orleans. Nelson Ham, Lewiston, 1st; D. P. True, Leeds Center, 2d.

Class V—MISCELLANEOUS ARTICLES, CANNED FRUITS, PRESERVES, ETC.

Best peck of cultivated cranberries. Silas M. Wing, Temple, $2.00; Dr. J. A. Morton, Bethel, $1.00.

Best variety of canned fruits, preserves, pickels, etc., made and put up by the exhibitor. Mrs. D. H. Colby, Lewiston, $3.00; Mrs. C. A. Miller, Lewiston, $2.00.

Best specimen of canned peaches. Mrs. A. W. Penley, $2.00; Mrs. M. Phauenf, $1.00.

Best specimen of canned plums. Mrs. D. H. Colby, $1.00; Mrs. C. A. Miller, 50c.

Best specimen of canned strawberries. Moses Crafts, Auburn, $1.00; Mrs. F. Hoyt, Winthrop, 50c.

Best specimen of canned raspberries. Moses Crafts, $1.00; Mrs. E. A. Lapham, Pittston, 50c.

Best specimen of canned cherries. Mrs. J. R. Hall, $1.00; Mrs. C. A. Miller, 50c.

Best specimen of canned quinces. Miss A. M. Jordan, Auburn, $1.00; Mrs. D. H. Colby, 50c.

Best specimen of canned tomatoes. S. E. Leavitt, Auburn, $1.00; Miss A. M. Jordan, 50c.

Best specimen of preserved quinces. Mrs. F. Hoyt, $1.00; Miss. A. M. Jordan, 50c.

Best specimen of preserved apples. Mrs. M. Phauenf, $1.00; Miss A. M. Jordan, 50c.

Best specimen of preserved plums. S. E. Leavitt, $1.00; Mrs. D. H. Colby, 50c.

Best specimen of preserved pears. Mrs. D. H. Colby, $1.00; Mrs. E. A. Lapham, 50c.

Best specimen of preserved strawberries. Mrs. M. Phauenf, $1.00; A. B. Chipman, New Gloucester, 50c.

Best specimen of preserved raspberries. Miss Addie Lapham, Pittston, $1.00; Mrs. D. P. True, Leeds, 50c.

Best specimen of preserved currants. Miss A. M. Jordan, $1.00; A. B. Chipman, 50c.

Best specimen of preserved cherries. Mrs. C. A. Miller, $1.00; Mrs. D. H. Colby 50c.

Best jar assorted pickles. Mrs. E. A. Lapham, $1.00; Mrs. A. B. Strattard, Monroe, 50c.

Best specimen tomato catsup. Miss A. M. Jordan, $1.00; Mrs. A. W. Penley, 50c.

Best jar quince jelly. Miss A. M. Jordan, $1.00; Mrs. C. A. Miller, 50c.

Best jar apple jelly. Mrs. F. Hoyt, $1.00; Miss C. M. Butts, Canaan, 50c.

Best jar grape jelly. Miss A. M. Jordan, $1.00; Mrs. C. A. Miller, 50c.

Best jar currant jelly. Miss A. M. Jordan, $1.00; Miss C. M. Butts, 50c.

Best jar strawberry jelly. Mrs. F. Hoyt, $1.00; Mrs. D. H. Colby, 50c.

Best specimen of evaporated apple. J. J. Towle, South Carthage, $1.00.

Class VI—FLOWERS.

In this class no article can be entered for more than one premium. All plants and flowers entered for premium must positively be in their places at the exhibition room on the second day of the fair, at 10 o'clock A. M.

For best display of cut flowers, filling not less than one hundred phials. Mrs. Chas. Stanley, Winthrop, $10.00; Mrs. G. B. Sawyer, Wiscasset, $8.00; Miss Cora E. Ring, Richmond, $5.00; Mrs. A. B. Strattard, $3.00.

For best exhibition of roses, not less than ten varieties. Perez S. Burr, Freeport, $5.00.

Dahlias, ten varieties. Mrs. Chas. Stanley, $2.00; Miss Abbie E. Ring, Richmond, $1.00.

Chinese Pinks. Mrs. Chas. Stanley, 50c.

Japan Lilies. Mrs. A. B. Strattard, $1.00.

Asters, ten varieties. Mrs. A. T. Clifford, Leeds Center, $1.00; Mrs. Chas. Stanley, 50c.

Pansies. Mrs. Chas. Stanley, $1.00 ; Mrs. A. B. Strattard, 50c.

The committee recommend a handsome gratuity to Mr. David B. Woodbury of Paris for a fine display of seedling pansies.

Zinnias. Mrs. Chas. Stanley, $1.00.

Phlox Drummondii. Mrs. Chas. Stanley, $1.00.

Balsams. Mrs. Chas. Stanley, 50c.

Petunias. Mrs. A. B. Strattard, $1.00 ; Mrs. Chas. Stanley, 50c.

Gladiolus. Miss L. M. Pope, Manchester, $2.00 ; Mrs. J. W. Thomas, Rockland, $1.00.

Verbenas. Miss. L. M. Pope, $2.00 ; Mrs. Chas. Stanley, $1.00.

SECOND DIVISION.

Best pair of parlor bouquets. Mrs. Chas. Stanley, $1.00 ; Mrs. J. M. Thomas, 50c.

Wall bouquets. Mrs. Chas. Stanley, $1.00 ; Mrs. A. B. Strattard, 50c.

Hand bouquets. Mrs. J. W. Thomas, $1.00 ; Mrs. A. B. Strattard, 50c.

Floral pillow. Mrs. A. B. Strattard, $2.00.

Floral design. Miss L. M. Pope, $5.00 ; John Burr, Freeport, $3.00 ; Mrs. Chas. Stanley, $2.00.

Dinner table decoration. Mrs. J. W. Thomas, $1.00.

Basket of wild flowers. Mrs. F. Hoyt, $1.00 ; Mrs. D. H. Knowlton, Farmington, 50c.

Exhibition of dried grasses. Mrs. A. T. Gifford, $2.00 ; Mrs. Chas. Stanley, $1.00.

Everlasting flowers. Miss Cora E. Ring, $1.00 ; Mrs. A. T. Clifford, 50c.

Dish of cut flowers. Mrs. A. B. Strattard, $1.00.

Fancy basket of flowers. Miss Cora Stanley, Winthrop, $2.00 ; Mrs. A. B. Strattard, $1.00.

Single pot plant. Mrs. E. A. Lane, Auburn, 50c.

Proceedings of the Winter Meeting.

The annual Winter Meeting of the Society was held in the hall of the Turner Center Grange at Turner, on Wednesday and Thursday, February 17th and 18th, 1886. The forenoon was occupied by a business meeting of the Society. At this meeting the annual reports of the Secretary and Treasurer were presented, accepted and placed on file. The election of officers for the ensuing year also took place. The Treasurer's statement and the names of officers elected will be found in other parts of the report. There was a very creditable display of winter varieties of apples; and in the material presented for consideration, the numbers in attendance, and the spirit and interest of the meeting, it was one of the best the Society has ever held.

FIRST DAY. AFTERNOON.

The Society met at 1.30 o'clock P. M., Vice President D. J. Briggs in the chair. Dr. J. T. Cushing of Turner was then introduced, who delivered the following Address of Welcome:

ADDRESS OF WELCOME.

By Dr. J. T. Cushing.

Mr. President and Gentlemen of the Maine State Pomological Society:—We are come together to-day, first to welcome you to the hearts and homes of our town. You represent an organization we are proud to have come among us—a company of men to whom the State of Maine owes a debt of gratitude. If he is a benefactor to the whole human race "who causes two blades of grass to grow where only one grew before," what can we say of a company of men through whose efforts our hill-sides have blossomed as the rose, and our storehouses and cellars have been filled to overflowing with the fruits of the earth.

We are proud to say this to you, brethren of the Maine State Pomological Society. We are proud to ascribe to you honor for the name and fame of our Maine apple industry whose line has gone out through all the earth, yea, even to the ends thereof. We are glad to say to you that your interests are ours—interests that the labors you perform in your meetings, and the thoughts you bring forward, bear their fruit all over this broad State, in better apples, more and more acceptable to the world at large, which has already learned that the apples of Maine are firmer, more highly flavored, and better keepers, than those grown in a milder climate on richer soil. We are told in our geographies and our children are taught in our schools, that the exports of Maine are hay, lumber and ice. It is time that apples were added to the list. Indeed during the past year I have taken pains to bring this fact to the minds of both teachers and pupils. In fruit culture, I believe that Maine is yet in her swaddling bands; our eyes have been closed and our ears have been stopped. We have not realized our capabilities nor our resources, but of these things I trust we shall hear later. We realize that it is to such men as you that we are indebted for the transformation of the stunted, inedible crab to such varieties as the blushing, luscious Baldwin, the golden Pippin and the delicate Bellflower.

We do not welcome you to-day to a town entirely new in the art and science of fruit culture; on the contrary we have not a few names among us whose successes and achievements in this line are well known to you. To them we commend you; for even as a diamond can only be polished by its own dust, so will your work be rendered more perfect by the co-operation of the men who are working in the orchards and gardens of every section of the State. So we welcome you to Turner, knowing that if we had no higher motive for our hospitality than a selfish one, we should be amply repaid by the good things you will bring us out of your storehouse of wisdom. We have not been left in doubt as to the origin of fruit. We find that the Creator gave to Adam, in the garden, trees good for food, trees yielding fruit, and that these were not put in as an afterthought of creation, but were placed upon the earth the third day. And if, as we believe, the troubles of man began with that fruit, we can console ourselves with the thought of this meeting, and of many other similar assemblies, where much good has been added to the aggregate of man's life from this same source.

In the days of the gods and heroes, a famous company was once gathered at a wedding feast upon Mt. Olympus. The goddess, Discord, had been slighted, when the invitations to the banquet went round, and to revenge herself upon the company, she threw among them a golden apple, inscribed "To the fairest." Jupiter, as the king of gods and men, was asked to award this prize; but as his own wife was among the claimants for the honor it bore, the prudent Jove shifted his burden of responsibility to the shoulders of Paris, a shepherd of Mt. Isla, who, after much deliberation and consideration of rival claims, awarded it to Venus the goddess of love and beauty. We shall have among us here, I trust, no apple of Discord, but there is a prize to be won. It may be won by many, and even by all. It is inscribed not "to the fairest," but to "faithful, earnest workers," and is given to all who put the energy and earnestness of their lives into the work which is around them.

This prize, a successful life and its results, is worth the winning, and will be awarded, now, as in the days of the shepherd judge, to those who have a spirit of love and beauty, a spirit of brotherly love and an appreciation of the beauty and grandeur and nobility of labor, which was not given to man as a curse but as a life-long blessing. We must enter upon and pursue the strife intelligently, with a due appreciation of its meaning. And to organizations like yours we owe the increase of fraternal feeling, and the added sense of the personal responsibility of the labor which is such a blessing to us in this age and generation. This interchange of thought and comparison of experiences add interest, even to drudgery, and we thank you for them. We are glad you have met with us. We welcome you to Turner!

The response to the above address was made, in behalf of the Society, by the Secretary, Mr. Samuel L. Boardman.

Following the above, President Pope was introduced, who proceeded to pronounce his annual address.

ANNUAL ADDRESS BY THE PRESIDENT,

CHARLES S. POPE.

Ladies and Gentlemen :—Once more it becomes my duty to address you on a subject in which we are all deeply interested. From the reports of the Secretary and Treasurer you have learned of the financial condition of the Society. While we are somewhat in debt, we have been able the past year to keep our expenses within our receipts, and we hope the time will soon come when our people will realize the growing importance of the fruit business in Maine and be ready to aid us in repaying our loans and in building up a live society.

Fruit growing in Maine is only in its infancy. We expect in a few years to see more apples shipped from Portland than from any other port in the country, and our markets and summer hotels furnished with small fruits from Maine gardens.

Where can the beginner get information better than by joining this Society and attending its meetings, where he may learn from the successes and failures of practical men.

If our fruit growers would mingle together more, there would be less money wasted in the purchase of varieties not adapted to this section, and in paying the tree peddler more per dozen for plants and trees than they would cost by the hundred at the nursery.

One is apt to become rusty by keeping too closely at home, and perhaps a little narrow and bigoted. We remember some years ago, seeing a man driving pine plugs in the holes where the apple tree borer left the tree, thinking to smother him, and we have seen several people lately who are satisfied that the disease called "sun scald" is caused by the flat-headed borer, and that apples must be allowed to "sweat" before they are in condition to pack away. Twenty years ago we thought we knew the whole story. We now realize how much there is to learn and the great advantage to be gained by contact with wide-awake men.

This is a suitable time to review the work of our fall exhibition and see where we can change and improve our methods, and any suggestions from interested parties would, no doubt, be gratefully received by the executive committee. The arrangement to hold our exhibition in connection with the State Agricultural Society seems to give better satisfaction to the people at large, than a separate fair at a different date; as few of our people can afford the time or expense to attend two exhibitions.

Our system of judging is not what we could wish, nor can we expect it to be until we can afford to engage experts from a distance who are not acquainted with the exhibitors, and will be free from all personal prejudice.

Very little has ever been done in correcting mistaken nomenclature at our fruit exhibits. The committee, when examining fruit, will pass without comment those specimens incorrectly marked, much to the dissatisfaction of the exhibitor, who cannot understand why his fruit was overlooked, and probably hard feelings are engendered and perhaps the judges charged with favoritism.

To prevent the loss of articles at the close of the exhibition, we think it necessary to enforce the rule that no one shall be allowed in the hall at that time, except those that have a pass with permission to remove goods.

There is one subject I have spoken of before, and I propose to bring it before you at every opportunity. It is to urge this Society to do all in its power to induce orchardists to be more careful in sorting their fruit.

I am aware that we have a better reputation now than a few years ago, but there is still room for great improvement. There is nothing gained by putting half a bushel of No. 2 apples in a barrel with No. 1. For example, a barrel of apples as ordinarily packed will sell for $1.75, from this take half a bushel of the poorer ones and refill with strictly No. 1 apples; the buyer will readily pay $2.00 for such fruit, the poorer ones will sell for half price and in this way the farmer gets more money, the buyer is better satisfied, and, what is of more importance, we shall add greatly to our reputation and our self respect.

How many fruit growers have taken the pains to ascertain how much it would cost to throw out one-fourth of the poorer apples and thus make up an extra lot. Let us look at the figures, with apples at $1.75 a barrel, four barrels would bring $7.00. Sorting out one barrel of the smaller and imperfect apples, worth at least one dollar, the balance would cost $2.00. Only 25 cents more on a barrel, but worth for exporting at least fifty cents more.

With an unusually large crop of apples for an off year, we have been receiving a fair price for late-keeping varieties suitable for shipping, while ordinary fall apples were hardly worth gathering. I hope we shall not be slow to see that if we would compete successfully with other fruit sections, we must take advantage of the better keeping qualities of our apples and plant those varieties largely that will keep until the more perishable fruit is disposed of. After another year's experience we are more than ever convinced that it is for our interest to take more pains in keeping our apples for late shipment. We think it would be a paying investment for some party to put up a building for cold storage in Portland, where those who have not facilities at home could send their apples in the fall, to be kept until wanted for shipment. There would be the advantage of lower freight, no danger from freezing in transportation, and the apples could be kept in better condition than in a house cellar, where it is almost impossible to keep a cool, even temperature.

With the increase of our orchard products the time will soon come when we shall not be able to obtain second-hand barrels in which to pack our apples, nor do we consider this a cause for regret. As soon as there is an established demand some parties will be ready to manufacture good barrels at a fair price. The gain will more than compensate for the extra cost. First in the improved appearance of the apples when the barrels are opened, for a small quantity of flour will remain between the staves of the old barrels even when carefully cleaned, which will be dusted over the apples when moved to mould and thus injure the appearance and sale of the fruit. The gain in having the heads all made to fit will be appreciated by those who have ever had experience in trying to head old barrels, when the top hoops were gone and a head to be made from odd pieces. Now is the time for us to see what measures should be taken to establish a uniform size for the apple barrel and avoid the trouble which some of the fruit growers have had in other States. There should be a uniform size throughout the United States and then there could be no trouble between buyer and seller on that point.

Our best orchardists have become convinced that a seedling tree is the best, all things considered, from which to start an orchard. For a few years past the call for good seedling apple trees has been larger than the visible supply. Thousands of trees would be set the coming spring could they be obtained. Here is a chance for some man to engage in a paying business. But a man without experience would be likely to lose money in the attempt.

While encouraging the planting of more fruit trees let us be careful to warn all, that the enthusiasm must reach farther than the mere planting. We cannot expect to raise choice fruit without constant care. The increasing depredations of insects must be met with increased vigilance. We have enough poor fruit; what we want is a superior article, that will sell for remunerative prices, even in season of plenty. Last fall when apples were hardly worth picking in some orchards in New England, we knew of Maine-grown apples being sold in Boston for five dollars a barrel. To get the highest price we must raise the best varieties, and pack only choice specimens, well pressed down in clean barrels.

A slack, lazy, shiftless man will never make much money by orcharding. With the enemies we now have to contend, a man connot lounge in the shade and make a fortune raising fruit. He must keep up a constant warfare and keep himself well posted on the best methods of cultivating and enriching his land and fighting the enemies.

Although the apple is our most important fruit, we must not ignore the smaller fruits and we propose at this meeting to give a little time to the consideration of the best varieties and methods of cultivation of some of these. So short a time is necessary after planting strawberries, raspberries and blackberries before we have a full crop, that many of our farmers now see the advantage of at least supplying their own tables with the small fruits.

It is wonderful how the contagion spreads in a neighborhood when some one begins the raising of these fruits and demonstrates how much easier it is to raise their own berries than it is to range the woods and fields for an inferior article. I have no doubt the time is near at hand when acres of small fruits will be planted for market, as we have the same advantage in these as in apples; they come to market after the southern-grown fruit is gone and prices have advanced.

One of the most important subjects to be considered at this time is that of obtaining horticultural statistics for the benefit of the grower. He should be informed of the probable yield of the different kinds of fruit and the consequent probable demands for the same, and thus be prepared to sell at a fair price. The fruit dealers keep themselves pretty well informed on the condition of the crop of the country and are frequently able to take advantage of those who are not posted. There is a chance for loss in two ways: one in selling too low, and another, when there is a small crop in this section we are liable to think the price must be high, and perhaps hold too long. While a system of reports for this State, only, may be of great value, it is small when compared with what we need. Our Commissioner of Agriculture should organize a system for the whole country. From his address before the American Pomological Society, we find he realizes the importance of having reliable reports in this department. Can we not at this time take some action to aid in forwarding the work? I would suggest the appointing of a committee to confer with other horticultural societies, and with the United States Commissioner on the subject.

The planting of shade trees along the highways and about our school-houses, and the ornamentation of our homes, might receive a new impetus if we would take it up in connection with the other work of the Society.

There is too much truth, even now, in Whittier's picture of country life.

> "The eye and ear
> And heart are starved amidst the plentitude
> Of nature, and how hard and colorless
> Is life without an atmosphere. I look
> Across the lapse of half a century
> And call to mind old homesteads, where no flower
> Told that the spring had come, but evil weeds,
> Nightshade and rough leaved burdock, in the place
> Of the sweet doorway greeting of the rose
> And honey-suckle; where the house-wall seemed
> Blistering in the sun, without a tree or vine
> To cast the tremulous shadow of its leaves
> Across the curtainless window."

Much lament has been made in our newspapers and out, because our sons and daughters leave the farm for more congenial employment the moment they are at liberty to do so. We admit the fact, but believe that in making the home attractive we have an easy and effectual remedy. We need not undertake great things in the shape of elaborate driveways, expensive gravelled walks and costly foreign trees and shrubs. A clean, well-kept lawn is within the reach of any Maine farmer, and, at very little expense and trouble, our forests will supply him with shade and ornamental trees, and the woodbine is at hand to festoon his buildings or fences. To these may be added from the nurseries such trees, shrubs or plants as taste may dictate or means permit.

In these days of cheap seeds, a flower garden for the girls of the family is not an expensive luxury, and well repays all trouble in the robust health produced by the out-door life, not to mention the refining influence on all parties. We can readily understand that young people who have helped thus to beautify their homes will be so closely attached to them as to require a strong inducement to begin an untried and uncertain life in a city.

We call to mind a charmingly shaded village where the enthusiasm of two or three men finally roused nearly all the others, and they planted shade trees on both sides of every street in the village. We see no reason why the farmers of a neighborhood should not thus join together, taking their boys with them, and give their time, for one or more gala days, to planting trees by the roadside and on the school-house grounds, thus adding to the attractiveness of the country and the comfort of travellers.

In closing we would say, we have never felt more encouraged in regard to the future of our Society. We are confident that fruit growing in Maine will increase until it shall become one of our leading industries, and while those who are laboring to promote this end may not receive much pecuniary benefit, they have the satisfaction of knowing that they have assisted others as well as themselves, which will be for them a sufficient reward.

At the conclusion of the President's Address, D. H. Knowlton, A. S. Ricker and C. A. Libby, were appointed a committee to take into consideration the suggestions and recommendations of the same, and to report at a subsequent hour. The programme was then continued with the paper of Mr. Pike, read in his absence by Mr. W. P. Atherton.

WHERE, AND OF WHOM SHALL WE PROCURE NURSERY STOCK?

By N. R. Pike.

The increasing demand for all kinds of nursery stock makes these questions of importance to every man who contemplates starting an orchard, a vineyard, a strawberry, raspberry, or blackberry patch. And, though there may be some diversity of opinion in relation to the correct answer, I beg leave to state my own views on these points.

I think I stated in a former paper read before this Society, that from my own experience and observation, I was confident it did not so much matter where nursery stock was grown, as *how* it was grown. And I still hold to that opinion. Yet, for the following reasons, my preferences are for Maine-grown stock. Not neglected fence-corner scrub stock, neither that which has been forced to form a soft, coarse-celled, spongy growth, like much of the stock brought among us from other States. All such stock, wherever grown, is worse than worthless for the State of Maine. Each year's growth should be well ripened and firm at the end of each growing season.

I speak from actual experience when I say that Maine-grown stock can be produced of far better quality than the *average* stock sold by smooth-tongued canvassers from other States and at half the price often paid for such stock. A vender of this sort said to me recently that it cost as much to dispose of his goods as it did to grow them. This statement needs no comment. Furthermore, it is a fact, though perhaps not generally known, that many of the canvassers for the sale of nursery goods are employed by men who never owned an interest in a nursery in their lives, but who, on getting in their orders, go to some New York nurseryman, and, at a small cost, procure such stock as no reliable nurseryman cares to send out in his own name, with which to fill these orders. And, in my opinion, this is one of the reasons why so much prejudice exists against New York stock. Another reason why we should prefer Maine-grown stock, though often urged upon our notice, will bear repeating, viz: The saving of a large amount of money at home that now goes out of the State. And yet another reason of still more importance is, that stock procured near home may be had fresh from the ground and in good condition, while that *pressed* into large boxes and shipped from a distance is always more or less damaged, and often rendered worthless from causes occasioned by long delays while in transit.

There are locations in every county in the State where all kinds of nursery stock adapted to our climate may be successfully grown. In fact, probably there is not a farm in Maine where such stock could not, to some extent, be grown with success and profit.

I think Mr. Atherton stated at the last winter meeting that the principal reason why nursery business did not meet with a more decided success in this State, was a lack of practical knowledge. This, to a considerable extent, is probably true, and is suggestive of a grand opening to the right man in the right place. And it occurs to me that a few young men of the right stamp could not do a wiser thing than to serve an appenticeship of at least one year in learning the details of the business, then return to Maine and make this their chosen and permanent profession. I believe almost unbounded success and the supply of an urgent demand awaits such an enterprise. And I am inclined to the opinion that this Society can no way more successfully advance the interests of the cause they represent than to make such effort as will result in this end.

But what I more particularly wish to impress upon the minds of those in want of any kind of nursery stock, is to give all canvassers a short answer and wide berth. And if the goods required can not be obtained at home, to give their orders direct to some reliable nurseryman in some other State. By so doing, stock true to name, of good quality when shipped, and at less cost, including cost of transportation, may be obtained. And in no case trust to the wily tramp who perambulates every town in the State, seeking whom he may beguile with his smooth words and pretty pictures. And here, I beg leave to make a statement of a case in point showing the advantages of ordering direct from the producer.

A certain party in the good old town of Winthrop, being desirous of entering into the cultivation of a good assortment of the small fruits for family use, interviewed several of the tramps alluded to, and found their prices invariably as much for twelve plants as the cost of one hundred ordered direct from the nurseryman and delivered in Winthrop. These facts, alone, not only make plain the situation, but commend themselves to the consideration of every one who contemplates growing fruit. And now while my pen is inked, I beg leave to call attention to the importance of small fruit culture. I wish to say to every man who has a family and owns a half acre of land, that there is no use to which he can devote a few square rods that will give so much satisfaction as the cultivation of a good assortment of the small fruits.

With comparatively a small outlay, and by devoting a little spare time to the pleasant occupation of cultivating the plants, and with the present facilities for keeping for future use whatever is desirable, every family may enjoy the pleasure of having some one of the small fruits on the table every day in the year. Every one has a penchant for these fruits, and, to gratify this taste, will range the field, the cutdowns, hills and valleys for them in their wild state, while by devoting far less time to the cultivation of the improved varieties than is required to gather the meager supply, an abundance of these fruits of far superior quality may be obtained. I am glad to know that the cultivation of the small fruits is on the increase in Maine, and if by calling attention to the subjects I have introduced shall induce even a few to give these matters their careful consideration, my object in presenting them will so far be accomplished.

Following the paper by Mr. Pike, the paper contributed by Mr. Bennoch, was, in his absence, then read by the Secretary.

HOW AND WHERE SHALL WE PROCURE OUR NURSERY STOCK?

By JOHN E. BENNOCH.

As a member of the Maine State Pomological Society, I wish to discuss some points covered by my experience of more than thirty years among both apple and pear trees. I notice one of the most important subjects on your programme for the winter meeting is on procuring nursery stock. This is to be treated by N. R. Pike, who, I have no doubt, will handle it with ability and present points that will be of general interest and importance to all fruit growers.

My theory is that we should grow our trees at home; raise them as near as possible to where they are to be transplanted for orchard purposes. In doing this trees can be removed from the soil with less mutilation of the roots, can be set sooner and with less exposure of roots, than can possibly be done with trees taken from commercial nurseries a long distance away from us, which are quickly and unnaturally grown, causing in nearly all cases a tender growth. The growth of an apple or pear tree does not want to be driven beyond its natural process for the first two or three years of its life from seed. Neither does it from a graft. Any growth stimulated by strong dressing beyond its natural growth in a good soil, is unhealthy, is injurious to the trees, and produces disease, such as black heart, dropping of sap, tender growth, easily winter killed and unabled to ripen up its wood for its own winter's sleep. All these diseases can be traced back to the forcing processes of growth of trees in the nursery.

In my visit to Sherman, Aroostook County, last fall, I was more fully convinced than ever that if the laws of nature are closely observed in the growing of products of the vegetable kingdom, the better would be the results. In many cases let the seeds take their own course and many lessons can be learned, by watching and studying the growth, and results, and products of the plant creation.

I refer to a number of specimens and varieties (unnamed) of natural seedlings, some of which I should judge at the time of eating would be very fine. These seedlings, as described to me, were the product of natural seed, and to my mind convinced me of the theory I have long held. F. K. Phœnix of Bloomingdale, Ill., is, I think, one of the strong advocates of this theory and plan. I believe in taking seed from large, good-grown, natural fruit, both apple and pear, to obtain hardy, strong fruit trees, and when a chance seedling shows itself it is generally a good one. It takes strong varieties to produce strong varieties, and this, I believe, is the only way to create strong sorts both as relates to hardihood and quality. Nearly all of our older noted varieties of fruit are chance seedlings, and grew natural and produced natural results. We have an account of about all of the hybrids and fancy fertilized varieties (Wealthy included) and not one of them ranks with our older varieties such as Baldwin, Northern Spy, Hubbardston and many others we all could mention; and these we can well affirm received no other attention than what they received from the natural gifts of the storehouse of mother earth. This is a lesson that will admit of greater study than it generally receives.

Trees coming from the hot-bed nurseries of New York and elsewhere as generally grown are not the trees for Maine men and orchardists to set out. I have heard men say in years past that they have orchards that are fine, and I also have seen them growing, but to-day many of them are showing signs of disease and decay. "Owing to what?" some will ask. I answer, owing to high feeding at the start, and being too quickly grown. This tells the whole story, and still farmers persist in buying and setting out these trees to meet with disappointment and failure. If I were to set a New York tree, crown grafted, I would not set any variety other than Northern Spy and Talman's Sweet to secure hardiness. The Spys I would re-graft on setting with bearing scions of the same variety. I do not claim that at this day a Northern Spy is a tardy bearer, but I think a man would be likely to die two deaths before a New York or a commercial-grown Northern Spy would bear, owing to being grafted with side shoots. The advantages are: grow stock from natural seed of good and large fruit at home for home orchards, graft well up with good bearing scions. The disadvantages are: plant trees sent hundreds of miles with roots mutilated and exposed, of tender and unknown varieties, that on producing (if ever) doom you to disappointment after years of toil and favorable expectation.

I think and believe that on the cold line of apple growing the short-jointed, stubbed growth endures the cold better than the long-jointed, spreading varieties. I also think that in producing seedlings, those to plant from good natural seed raised in their vicinity would be the best way to promote hardihood; that they would be more likely to meet with success than in any other way. The best way to procure pear seedlings is from the native pear seed, then graft with Flemish Beauty, then double work up with other varieties as may suit you. I mean in Maine and other like climates.

In referring again to the short-jointed growth on the cold line I will explain now what I then omitted to do. The short growth spoken of ripens up quicker than the opposite, and that is one of the main points as to wintering free from winter killing. All woods that ripen late are more likely to have a hard winter of it, especially in the North.

With me the insect problem is one that still needs study. The borer I consider is the worst of all pests that infest the apple orchard and I know of but one sure way to stop it, which is to prevent the beetle from depositing the egg. This can be done by wrapping the trunk with cedar or any other kind of bark and inserting the bottom of the bark into the ground half an inch or more. This pest is, I think, on the increase, and great care should be taken to prevent its ravages. Borers have infested orchards the past season where they have never been seen before. Hundreds of apple trees are dying from the effects of the borer. It will pay well to fence orchards of one acre or even more for a poultry run. With me the past season the codlin moth has not troubled my trees. Sheep and hogs kill a great many if allowed to pick up windfalls, which they should. The apple maggot bids fair to cause great trouble. I have had none as yet, but I know of orchards within four miles that have been nearly destroyed by them—in fact, some varieties entirely so, the Fameuse and Gravenstein so much so that the apples were not harvested. I do not know what can or will be done, but something should be done by our Legislature in this direction, for I believe that they are destined to ruin our crops of apples. Wherever they go they destroy, and all fruit touched by them is utterly worthless. I hope at this meeting you will discuss this dreaded pest and try and provide for its future study and destruction.

DISCUSSION.

Mr. W. P. Atherton. I think that we ought to raise our own trees. I believe that Maine is capable of raising all the trees she wants. What we want is young men who have a practical knowledge of the business to take it in charge. There is a great difference between western-grown trees and Maine trees and I should class the former as soft and do not think it best to buy them. Last year, near the spring, I wanted twenty-five Baldwin trees and I went up to Mr. Chase who couldn't let me have them, so I sent to New York and got them. When they came I undid the bundle and found the roots bruised. The trees were set out and were taken up again in the fall and the bark was found to be soft. They were of good height but had started to bud and the roots were all mangled and cut up. They had been planted and re-planted and re-planted and I knew it. I set them out again and pruned the roots, tops and suckers. I should not be disappointed if they all died, as many of them are already dead. I have always had good luck in securing hardy stock from western dealers previous to this, and have trees now in my orchard that are ready to break down in the fall they hang so full of Rhode Island Greenings and Baldwins. From one-half acre of New York trees I have packed one hundred and twelve barrels of apples. The trees were set seventeen years ago in rows twenty-four by twenty-four feet apart. These trees are in a favorable location and receive a good deal of wash and the soil is adapted to the variety. We do wrong if we speak of everything out of the State as a humbug. I do not want to class all as frauds. Many tree venders have no practical knowledge of the business. We must look out for those who are not honest.

Hon. Rufus Prince. I am afraid you hear me too often, but in order to have no time run to waste I will say a few words. I do not want my trees driven too hard. I want my trees fed *well* for I believe they are hardier and will make better orchard trees than where they are forced. Forcing them makes them black hearted. I can't see that Maine trees are any better than New York trees. I have taken up trees after they have been allowed to grow and have found no more black hearted ones among New York trees than among Maine trees. High feeding in a nursery makes a good looking tree but is then black hearted. If a tree is poor it shows itself soon. I do not know why New York trees are any more tender than ours. They raise the same kinds that we do and if we order tender varieties in New York we get them. Are short-jointed trees most hardy? When I see a short-jointed tree I see one with a small apple and I should graft it as I consider it folly to raise a tree of that kind. I think a man may safely make that a rule.

Mr. O. C. NELSON. What is a long-jointed tree?

Mr. PRINCE. In all natural fruit you find spurs near together. I think that when these are near together the tree is short jointed. In speaking of borers, I visited an orchard in Jay, owned by R. P. Thompson, in which the trees were done up with tarred paper. We looked at them and we did not find a borer.

Mr. L. F. ABBOTT. Is there no danger from using the paper?

Mr. PRINCE. None to the bark, and still we found as many there as we did on those without the paper.

Mr. NELSON. How is the paper fastened on?

Mr. PRINCE. With twine.

Mr. NELSON. I will say just one word about New York trees. I have had some experience in disposing of them. The only difficulty is with the purchaser. The nurserymen will agree to furnish as many varieties as the buyer wants and if he can't supply what is ordered he puts in some other kind to fill the order. New York trees are the best in our section of the country. Did that gentleman in Jay take pains to look above the tarred paper?

Mr. PRINCE. Mr. Thompson spent an hour in the orchard. The paper was set down into the ground and we found no borers at all. I have found them as far as I am concerned.

Mr. NELSON. Isn't it possible that the gentleman meant by a short-jointed tree one branching near the ground?

Mr. PRINCE. Perhaps so.

President POPE. As I understand it the buds in short-jointed trees are very near together on the twigs. In long-jointed trees, as the King of Tompkins, they are far apart.

Mr. ATHERTON. Would the Rhode Island Greening be a long-jointed tree?

Dr. J. T. CUSHING. If a tree is a rapid grower it will be long jointed.

Mr. NELSON. Would that hold good in all cases? The King of Tompkins is the longest jointed in buds and it is also one of the hardiest.

Mr. H. L. LELAND. I reside on the cold line, and I think those varieties where the buds are close together are hardier than where they are wide apart. In our county the King of Tompkins is not a hardy variety.

Mr. NELSON. If the Baldwin is among our short-jointed trees why is it a tender variety?

Mr. D. J. BRIGGS. I wish Mr. Bennoch had given us a little more light on the apple maggot question. It is a very essential point. In order to have fruit bring high prices it must be free from worms. I put tarred paper around fifty pear and ninety Baldwin trees and in one year I had lost ten of them.

President POPE. What was the cause?

Mr. BRIGGS. I think it killed the bark as in removing the paper the bark all came off.

Dr. CUSHING. Did you bind the paper tight?

Mr. BRIGGS. No, sir. I bound it quite loosely. I don't believe we should use it at all.

President POPE. Were those trees any more exposed to the sun than others in the orchard?

Mr. BRIGGS. Not any more than others. I set out two or three hundred trees at the same time.

Mr. W. H. KEITH. I would like to bring up the subject of the sorting of apples. Mr. Ricker, what do you consider a No. 1 apple?

Mr. A. RICKER. One with no worm holes in the apple, and no appearance of any.

Mr. KEITH. How small size?

Mr. RICKER. I can't tell, but if they are sound and not too small I put them in.

Mr. KEITH. How many put their apples in bins?

Mr. RICKER. Quite a number in our section; most of them without sorting. This is quite an essential point in regard to reputation. We do not practice it, but always sort them before we bin them.

Mr. BRIGGS. Do you pick off from the tree?

Mr. RICKER. Yes, and then sort on the ground. Of course there will be some shrinkage. Baldwins shrink about one barrel in fifty, and out of thirty-five barrels of Bellflowers I only lost about four quarts. Both were binned in the same cellar. Perhaps my case in sorting is different from some others. I evaporate all No. 2 apples and have bought No. 2 apples of my neighbors to evaporate. I put none but No. 1 apples in the cellar. I sort apples in the fall and if particular, by so doing I get a better run. I have seen apple buyers put in as N. 1's, apples which I would not put in. We should club together to ship. Mr. President, I would like to ask if apple barrels were scarce last fall?

President POPE. They were. Some were unable to get them.

Mr. KEITH. I think it lots of extra work to prepare second-hand barrels. It looks to me to be very expensive and laborious work to wash out every barrel before it can be used. These new barrels are better for us. I know some will take old ones because they are cheaper. I have had good flour barrels offered to me for fifteen cents, but I would take new ones at twenty-five cents instead.

Mr. PRINCE. Are they planed?

Mr. KEITH. No, not wholly.

Mr. PRINCE. Are they straight or bilge?

Mr. KEITH. Bilge.

Mr. S. L. BOARDMAN. What is the kind of wood of which they are made?

Mr. KEITH. Generally birch, but also of other kinds. I think they should be used.

Mr. RICKER. Are they all of the same size?

Mr. KEITH. They are the same size as a flour barrel.

Mr. J. K. HAMMOND. Many in our section have had the privilege of procuring new barrels at from twenty to twenty-five cents each. We get them, and although there are a number of thousand made there are not enough to supply all who want them. I would pay thirty-five cents for them. They are of good stock, planed, heads planed, and flat hoops. I consider those with flat hoops the best. They are a little smaller than a flour barrel and save about one barrel in fourteen. We have had a sad experience in packing apples. The men who came to buy apples would buy almost anything and got us in a bad way of packing. For the past few years we have shipped our apples across the water. There are but very few in my section of the country who bin their apples. They sell them all in the fall of the year.

Mr. KEITH. Why were these barrels smaller than flour barrels?

Mr. HAMMOND. The heads were the same size but there was not so much bilge to them.

Mr. NELSON. I have had some experience with these new barrels.

Mr. KEITH. How much did they hold?

Mr. NELSON. They fell short from two to four quarts.

Hon. Z. A. Gilbert. In regard to the size of the apple barrel I think we should be cautious. They had a law in New York fixing the dimensions of apple barrels and they are smaller than flour barrels. This resulted in the refusal of buyers to purchase apples packed in small barrels and their manufacture was stopped and all fruit is now packed in barrels the size of flour barrels. We shall have to provide barrels soon, as the apple crop will increase, and these barrels should be of uniform size. Much care should be exercised in packing, for, as the trade is now managed, the principal part of the apple crop is sent abroad. If a grower puts up good fruit he will get no benefit by selling them to dealers here. Ship them yourself and in time you will reap the benefit.

President Pope. I will read an extract from a letter from Mr. Chas. W. Garfield, Secretary of the American Pomological Society: "We use barrels of two sizes, one holding two and three-fourths bushels, and the other three bushels. Dealers now pay twenty-five cents." Michigan apples are universally packed in new barrels.

Mr. Briggs. It is well known that there are two sizes of barrels, as cheap flour is put into smaller barrels and pressed harder than the best flour. I am aware that it will be necessary to purchase new barrels for the reason that those who purchase our apples will be better satisfied. I wash my barrels well, but you can't get all the dirt out. We must be careful in packing apples. Some purchasers pack the apples themselves and put in many which I should be ashamed of as No. 1 apples and would reject. Where apples are packed carelessly they are almost sure to open badly. One Canada dealer has put all kinds of apples in as No. 1 and this will ruin the market.

This closed the afternoon's discussion.

EVENING SESSION.

President Pope called the meeting to order at 7.30 o'clock, the hall being filled. The first essay presented was,

WEED YOUR OWN GARDEN.

By Zilpha S. Prince.

In a place where land is as plenty and cheap as it is in Maine, surely each one, man, woman and child can have, at least, a spot large enough for a garden. Of course, to have a really fine garden, it is necessary to have good soil, rich, fine and mellow. If we can't have just such as we would, however, we should make the best of such as we can get. Even poor soil can be worked over, pulverized and enriched till the waste places may be made to blossom like the rose.

Thorough preparation of the soil in spring is necessary. It must be spaded deep and well worked over or many of the best elements will be of little or no use to the growing plants.

Another essential is plenty of room. Don't try to crowd all kinds into a quarter of an acre of ground. Have the size and quality of your plot in mind when deciding what and how many kinds you will try to raise. Good seed is, if possible, more important than good soil. If we hope for the best of plants and fruits we should be sure that all seed used is from the best varieties of thrifty plants, ripe, fresh and pure. The best that can be obtained is none too good and is cheapest at whatever cost.

Don't hurry. To be sure some plants should be started early, especially if we want green peas for dinner on the Fourth of July, or the full beauty of our asters before the early frosts. Most seed must, however, be sown in dry, warm soil, or it will never germinate.

When the ground is ready and the seed sown our work is but just begun. For a time, to be sure, we can only wait as patiently as may be for the tiny shoots, but with those for which we are watching we shall undoubtedly find growing many more that we did not sow and do not want. Tiresome is the work of weeding, but tireless must be the weeder if he hopes for success. Do this as you should do everything, *thoroughly*. Pull up by the root and utterly destroy every weed as you find it. To break or cut them off with the hoe simply makes them grow better. To pull them up and leave them to die on the ground will, like transplanting desirable plants, make them thrive. If we think that we have destroyed every one to-day, careful eyes will find at least one more to-morrow, and here as in all the work of life we shall find that "Eternal vigilence is the price of success."

If all here present are not gardeners in the usual acceptance of the term, they are in a much higher sense. Our minds and characters are gardens in which each one is in great measure responsible for his own failure or success. The soil is prepared for us in early childhood and much of the seed sown. Shielding a child too carefully from trouble is like smoothing the top of the soil in the other garden and leaving the depths undisturbed. Every one needs the discipline of trouble as every garden needs the spade.

Every person is constantly sowing around him seeds, either of figs or thistles, which are sure to bear fruit in the lives of those around him. As teachers and parents, some have greater responsibility than others. Crowding here is, as in the other garden, disastrous. No child's mind can grasp everything but will intuitively lay hold on what is best suited to itself. Sow only the best seed—pure words, loving deeds, kind acts. Seeds of kindness, honesty and fidelity, like the peas, should be sown early, but those of knowledge may safely wait.

Most of us have passed the springtime and are now in the busy summer of life. No matter how much care has been used there are weeds—bad habits, to be found growing in every character. Here each must do the work for himself and upon his faithfulness depends the beauty of his life.

A weed found growing in every community is sometimes called procrastination, sometimes harsher names. A meeting, perhaps like this, is appointed at ten o'clock. At a little after eleven the president calls the assembled few to order and soon the first speaker takes his place. No sooner has he commenced to talk, however, than the door opens and a few more come in. Quiet is restored only to be broken again by more and still more tardy ones, till by noon the hall is well filled. Many of the company not only lost the best paper given, but annoyed the speaker and disturbed those who were in season. I know one man, whose garden is freer from weeds than most of ours, who never heeds the call to dinner till he has hoed out his row, thus keeping the meal waiting and delaying work in the house. If we could "see ourselves as others see us," many of us would make a desperate attempt to catch up and keep up.

One of the weeds which demands our constant care as men and women is fretfulness. I presume all like myself often resolve that they will conquer this habit, thus hoeing off the top, but how many of us can say that this plant is never found in our gardens? It is very easy by giving way to our feelings when something is not done as we would do it, or when something is forgotten which we consider important, to fret about it and it may require some determination to speak pleasantly or some biting of the lips to keep still, but which is the better way? Which makes those around us and ourselves happier? Which will be most likely to make the careless or forgetful one remember next time? If each one present will destroy this weed in his own garden there will be less of the seed ripen to be sown in those of our neighbors.

Another weed which grows so large as to cast a dark shadow on some lives is gloominess. If any one when despondent or, as the saying is, when he has the "blues", will count up his blessings, he will find that they far out-number his troubles. Many of our blessings we never think of till we are deprived of them, while we are very likely to magnify our troubles. Did you ever know a person with whom you would exchange places and lives? Mr. A may have more money than you, or Mr. B may have some office which you have long wanted. Learn all you can of the daily life, cares and worries of both and you will feel satisfied that you do not care to exchange places with either if you must live his life and do his work. Every burden is fitted to the shoulders that must bear it. Let us learn to make our own as light as possible by looking on the bright side of life.

Two varieties of the live-forever family which all recognize as weeds, although nearly every one finds one in his own garden, are known by the names profanity and slang. All of us know that an oath or a slang expression weakens our speech and injures us in many ways, yet there are few of us who have destroyed the weed. It was planted in many of the gardens by our fathers and mothers, but I hope none of us are planting the same for those who come after us. Daily, yes, hourly, will be the struggle if this family of plants is eradicated from our midst, but how much more beautiful will be the gardens of our lives if we succeed.

How many of us, sisters, are careful to be as neat in our personal appearance, in the care of our houses, in setting our tables for our own families as for guests? How many of us speak as pleasantly to members of our own household as to those who are strangers to us? How many of you, brothers, clean your feet as carefully when entering your own kitchen as when you go into a neighbor's? How many of you ever thank your wives and daughters for the favors for which you are so grateful from a stranger? Is not true politeness at home a plant which should be carefully tended while we root out all shams which make us urge a visitor to come again soon and when she is hardly out of hearing remark, "O how tiresome she is!" Which make us a scold at home and a gentleman or a lady away? Let us remember that true politeness comes from the heart and cannot be put on with a dress coat, then laid away with it for another state occasion.

All ought to root out false pride and in its place plant the real, genuine article. How foolish to be proud of a pretty face, fine clothes, sweet voice, etc., all accidents of birth or circumstances! On the other hand, who is and should not be proud of being one of America's noble men, helping to make all around him better and happier? All should have sufficient pride to make the best possible use of all talents given us by an ever bountiful Father.

The last weed I shall mention and one which I hope none of us have to contend against, is dishonesty. I do not refer solely to the taking of thousands of dollars, but to taking advantage of others in petty dealings, in the weight of a few pounds of sugar, putting the largest, fairest apples at the top and recommending them as alike all through, or praising an animal which—well, which for reasons best known to yourself you are particularly anxious to sell. Let us so live that we can fearlessly look every one in the face, remembering that "An honest man is the noblest work of God."

Many seeds we planted in our minds and hearts for which we are not responsible and many more are being planted every day. The books we read, the work we do, the company we keep, are constantly changing our lives.

We may get some good from every one into whose company we are thrown, if it be only because we see in them a magnified image of some plant which we know should be uprooted in ourselves. We all want people to think and speak well of us, we desire money and all forms of material prosperity, but of how little importance are all these when compared with our minds and hearts. We alone are responsible for these. Seeds are sown by others but we alone can do the weeding. Let this be our first care, that in the sight of the Great Master in the last harvest, no life be found overrun with weeds which we have allowed to grow.

The next essay, written by Mrs. Simpson of Bangor, was read by Miss Vesta B. Edgecomb of Turner.

THE ARRANGEMENT OF FLOWERS.

By Mrs. CORELLI W. SIMPSON.

Before Eve walked in the garden, flowers bloomed in Eden. Was she, to whom no flowers were forbidden, ever known to frown upon any of the beautiful blossoms that had been her favorites and to call them weeds, merely because of their abundance?

Any particular rules, as to the arrangement of flowers, would, in a few weeks' time, be utterly worthless. Fickle fashion changes so continually that the roses of last month all had to be replaced in the florist's window by lilies of the valley. But a week since the graceful lilies were banished to make room for the yellow chrysanthemum. Yesterday it was the fragant white lilac and to-day it is the modest violet which occupies the chief place in the ball or drawing-room, and the florist, like the milliner and dress-maker, is expected to keep pace with the various moods of the exacting dame.

Fashions may rage in flowers, but the beautiful and fragrant flowers, like lovely faces and exquisite poems, can never be out of fashion. A lady friend—a true colorist—and of whom it can be said that the soul of the artist is portrayed in every touch of her brush, in conversation with me to-day, remarked that "a sunflower will always be beautiful in spite of Oscar Wilde!" A popular freak may make the dark hair and rich complexion of the Spaniard supersede in public favor the rage which the hair of Eugenie caused; nevertheless, the Titian "red" hair accompanied with its fair complexion and its corresponding delicacy of mind and perception will be none the less beautiful.

Commerce, by the daily communication of specimens, has made the once rare exotics now almost common flowers, and we see in greenhouses, clover, violets, buttercups and daises advertised as "very scarce and high in price." In the matter of floral decorations, to be successful, one must understand the art of producing the necessary harmony of colors, the fundamental rules of which are taught in the kindergarten. Every child is there made to understand that there are only three primary colors—red, blue and yellow. From these arise the secondary colors—orange, composed of yellow and red; green, composed of yellow and blue; and purple, composed of blue and red. These form contrasting colors to the three primary colors, with which they are in harmonious opposition, as orange with blue, purple with yellow and green with red. From the combination of these secondary colors arise three tertiary colors—olive, composed of purple and green; citron, composed of green and orange; and russet, composed of orange and purple. The tertiary colors are in harmonious opposition to the secondary colors from which they are combined, but they form neutral tints to the primary colors, with which they harmonize. Red, blue and yellow harmonize and may be placed near each other, but purple should not be placed near red or blue, as it is composed of these two colors; for the same reason orange should not be placed in juxtaposition to red or yellow, the rule being that no primary color should be brought into contact with a secondary color of which itself is a component part; nor any secondary color brought into contact with a tertiary color of which it is a component part. I find exceptions to this rule, but there are colors and colors, and tones and tones of each color, until one is so blended into the other that we can scarcely discern where one leaves off and the other begins. One of my objections is the juxtaposition of the green and blue. One never wearies of the varied Scotch plaids, in which the green and blue figure so harmoniously together, and the peacock's feather being toned by the mass of golden brown which is flecked with the same colors will never cease to fascinate the lover of brilliant coloring; and, too, every blue flower has its own green leaves with which it is harmonious. Nature, so lavish in her blue overhead, is choice of her blue in the blossoms, but there is one dainty floweret whose blue tint is not reproduced in the floral kingdom. You ask its name? The little blue eyes will answer you in the one word, forget-me-not. Another general rule is, that the secondary and tertiary colors and the neutral tints arising from combinations of the tertiary colors—as brown, slate, grey, lavender, maroon, etc., should be used in lavish quantities, and the primary colors in sparing quantities for heightening the effect. In combining red, blue and yellow flowers, use nearly twice as many of the blue as of the red, and nearly twice as many of the red as of the yellow, to produce a pleasing harmony. One should always consider well the back-ground as well as the light to which the flowers are to be subjected. The whole arrangement may be spoiled by an unsuitable back-ground, and artificial light so changes the tints of many flowers that the charm of harmonious effect in the light of day proves a mortifying failure in the evening. As every face and its natural complexion is best set off by its own natural hair, and as no dress can be more becoming than the one which will best harmonize with the hair and eyes of its wearer, so a flower can be accompanied with no tint better suited to grace its stem than its own natural leaves, and we are thankful to say that the time has long since passed when it was considered necessary to strip a plant of its leaves and conceal its stems, to make its blossoms presentable. Let a person who has never studied true coloring, and who looks upon the "hanging forests," the wide-spread meadows with their hillocks and velvety dales, rich in their varied lights and shades, as one mass of one color, namely, green—a composition of blue and yellow—I say, let such a person attempt to form an harmonious arrangement of the various leaves without flowers, he would find it no easy task. There are nearly as many shades of green as of flowers, and a proper blending of the shades of green requires taste and experience.

Allow me to illustrate the absurdity once called a bouquet by a short story:

John has loved his Eliza from his earliest recollections and Eliza loved her John with equal fervency. But a stone wall divided the broad fields of their sires; but Eliza was miles away at the time to which we are referring upon a visit. As John in his loneliness, caused by the absence of his Eliza, walked around the farm and among the flower beds, gorgeous to John on account of the number of plants huddled into each, and as is said of the crazy silk patchwork quilts "no two alike," he paused before the "crazy" colored strip beneath the front windows and mused aloud, "If women could get that coloring into their rugs they'd be beauties!" But just now a happy thought occurs to the warm-hearted John. "I will send Lize some flowers,—flowers? Yes, a regular built bowkay." To think, for John, was to act, and in preparation for the building (already a massive, brilliant structure arose before his mental vision), he cut flowers of every hue, size and shape, throwing them in a promiscuous heap upon the stoop, which ran along the front of the porch. After having, in this manner, collected, as he termed it, a "cart-load" of flowers, he proceeded to divest each individual blossom of its natural habiliments. Not a leaf would he allow to remain. The pure, chaste flower-faces seemed in vain to look up and plead for their rightful gowns of tender green, but the practical John said, "A bowkay of posies wouldn't be a bowkay if 'twas stuck full of green leaves." Next, he brought a ball of coarse, stout twine which, in his earlier years, he had intended for a kite string. Sitting upon the upper step, he commenced in earnest to construct the message of love for his dearest Eliza. First he selected a tall, large, dull brown colored zinnia, not at all for its hue, or for the flower, but because it had a straight, stalk-like stem. Tying one end of his string firmly and well up to the petals of the flower, he laid it upon his knees and proceeded to take the *nearest* blossoms, without regard to size, color, form or fragrance, and, placing them in a circle close around the zinnia, he bound the twine many times around the stems. Proceeding thus the "bowkay" grew in height, circumference and in weight. "There!" he exclaimed as he had drawn the cord so tightly as to break the slender stems of mignonette and forget-me-nots and other fine flowers. "Those look purty and graceful enough when growing, but they are peskily tender-like for a bowkay," and giving it a vigorous shake the "pesky," tender blossoms showered down around his feet, but, at the shaking, he found (using his own words) "the concern to topple." As a remedy, by the aid of his jack-knife, he sufficiently sharpened a stick to push it up among the tightly-bound stems. The stick nearly at the top resisted, but John possessed a firm arm and a powerful will and a final thrust sent the poor zinnia flying into the air. The string was broken and the choked and smothered blossoms rolled out over his knees, down the steps to the ground, but John's heart was full of love and nothing could ruffle his temper in *such* a frame of mind. Piling up another "cart-load" of flowers, he re-commenced. He tied his stick to another neutral-tinted zinnia and he was successful beyond his most sanguine expectations, because his string held out to the end of his flowers and his flowers to the end of his string. Would not his Eliza measure his love by both? He saw but one fault, too many white flowers happened to be piled on one side together, but John was a young man of resource, equal to the emergency. He twisted a half-blown, red peony bud from the bush near the stoop, and, taking a pin from his well-filled pin-cushion—the edge of his vest—he fastened the bud to the inside of a large calla lily; finding that a success, he fastened two more above, exclaiming, "By hokey! Eyes and mouth! That's me, and just in the nick of time, too." He hailed the passing stage-driver, to whom he confided the "structure" and message, "A bowkay for Eliza."

Not less absurd and grotesque are the devices wrought with flowers for public occasions, and more particularly at funerals. It would be no more ridiculous to build a roof over the forest than to bring such quantities of flowers which need the pure air to the very heavens, as are seen in the various fantastic designs at halls, churches and even in dainty libraries. As I pause in writing, I can see a branch of an apple tree from my window. Yesterday it was clad in an icy armor which reflected in the sunlight as if bedecked with diamonds. To-day it it is wrapped in a mantle of snowy ermine no less beautiful in its stainless purity, "still life" it is called, yet, in the stillness of summer, the vital current with ceaseless motion courses to and from its heart to every twiglet upon its outermost branches. This branch will scarcely be left bare long enough for me to sufficiently admire the wonderful intricacies of its crossings and interlacings of its numerous twigs and the many neutral tints of its outer garment, before the delicate green will peep forth followed by a wealth of exquisite pinky blossoms. The red buds, the patches of blue heaven in the background and the yellow in the center of the blossoms, also brought out by the sunlight through the green leaves, complete the perfection of coloring which bring those subtle modulations of delight. Imagine all the blossoms strung into a long garland and then woven like a thread into letters and devices upon a bed of white carnations. After the first glance of eager curiosity as to the number of flowers, the whole thing assumes a most grotesque appearance. All devices and what are termed "artistic" designs should be carefully avoided, for when the decorator tries to out-do Nature, the only perfect pattern, the result is an unmistakable failure. Aim at the *simplicity of nature*. We can remember when every painted flower piece had its flowers placed exactly in the middle of the canvas. A better knowledge of the harmony of coloring has produced a great variety of styles and each artist can now revel untrammelled in his or her conception of the beautiful. As our lives are successful or otherwise only by association or comparison, so flowers are made to appear more or less beautiful by arrangement or contrast.

For distant effects yellow is by far more effective than any other color. Note from the carriage or car window the brilliant golden rod vying in grace with the over-towering elms, and what can be more grandly exquisite, upon an October afternoon, than the glory reflected by the setting sun upon a row of maple trees, with their halo upon halo of canary and yellow leaves?

I have a fondness for specimen glasses (if the glass vases are crimson or green; the delicate shades—just a tint of color—are prettiest) for tall, choice, fragrant flowers, each holding one blossom or one spray of blossoms, of course with its own green leaves; and glass trays for low-growing flowers, in which case sand or moss should be used besides the water.

In cutting, a knife will not bruise the stems as do the scissors. Ferns, the most beautiful for decorations made chiefly of green, should be dipped into tepid water before placing them in position. A cool, dark cellar is the best place to keep them until ready for use. As a rule, very fragrant flowers, as lilies, lilacs, &c., should be used in very small quantities in the dining-room or library, and avoided altogether in the sleeping-room. Small, neat plants are most effective; if large sized they tend to give a heavy appearance. In finger glasses several rose-geranium leaves should float and each may be pierced by the stem of its blossom, allowing a bloom to rest upon each leaf. For the mantel-piece larger and bolder varieties of flowers may be used than for the tables, but they should be so placed as to avoid all appearance of crowding. Trailing plants look well drooping from such positions, as clematis, ivy, hops, passion flowers, colloseum ivy, oats and wild field grasses, asparagus, carrot tops and ferns are all effective when enough of the green cannot be found to accompany the flower.

Ferns are especially useful, as they can be cut when too large and the ends used. A beautiful pair of bouquets representing fruit and flowers can be arranged, one of the high-bush cranberries and white snowberries, and the other of London pride and feverfews or white lilies, each intermixed with lace-like flowers or grasses to tone the "invincible scarlet" effectively; the scarlet only showing through the hazy veil of the fine thread-like flowers as through smoke or mist. If in doubt how to arrange flowers to send to a friend, send them lying loosely without any attempt at arrangement, but only send two or three varieties, never more. If doubtful what flower to use when partially arranged, take a white flower, as it can be safely used to separate any shades. The lily is (not the *lilies are*) a symbol of purity, therefore, one lily as a gift is more speaking than several. The same may be said of many other flowers. Small, neatly-arranged baskets of flowers are always attractive. Zinc pans should be made to fit into them to hold the damp sand or moss. Roses all of one color fill these admirably, their own foliage preferable (with half-opened buds and their young flower shoots) even to the fronds of maiden-hair fern. Many of the silver-edged plants are pretty in themselves, but they cannot well be mixed with other flowers if pure white flowers are used.

Flowers for the hair, corsage or for the hand should be flowers of delicate structure and exquisite fragrance. Those in the hand and corsage being under the close inspection of the eye, extra care should be taken that there be no violent contrasts. As one plant needs sunshine, another shade; one requiring moisture, another dryness; no general rule can be given for their cultivation. One person pets the sweet brier, another the heliotrope; one will prefer the scent of the lemon verbena, and another that of the sweet pea. That is well. We would not like a stereotyped sameness in the arrangement of flowers any more than we would in faces.

Finally, to those seriously disposed to possess this elevating and inspiring art, I would say, go to the fields and woodlands, by the meandering brook and by the hill-side, collect these plants, one at a time, from their native haunts, and study their habits and their needs by cultivating them in your own garden. Draw them in black and white, faithfully delineating each curvature and graceful outline, not only the blossom but the whole plant. Next copy each hue and shade, each tone and semitone, either in water colors or in oils. Let no tint, however subtile, escape your eye, remembering "to take care of the shadows, the lights will take care of themselves." And lastly, I ask you to describe in your own words, not only the plant botanically, but to discriminate between the velvety and the satiny texture, the honeyed, trailing sweetness and the delicious, spicy odor, the dawning of the bud and the decaying of the flower and all the sweet loveliness and the fine fascinations until, in the glow of the effort, every pore is open to the pleasurable sensations produced. Then, and not till then, the flowers become like old-time loving friends, and come into graceful harmonious arrangements, without a thought of how it was accomplished.

In the absence of the writer—who is a widely-known and successful grower of the coleus and the originator of some of the finest varieties of this grand bedding plant we have ever seen—the following essay was read by her brother, President Pope.

SOME HINTS ON MAKING COLEUS BEDS.

By Miss L. M. Pope.

The Pilgrims came to this country so thoroughly imbued with ascetic principles that the love of things beautiful, even in nature, seemed to them a snare to the soul, whose primary occupation was fighting the pride and vanities of life. Then their constant struggles with the deprivations and hardships of pioneer life left them little time for the indulgence of æsthetic tastes, if their consciences would have permitted such indulgence.

There must have been a grim fitness in the diminutive log cabin, with its scanty furnishings, surrounded only by the growth of wild plants indigenous to the soil. It certainly might prove interesting and instructive to note the first beginnings and growth of a taste for out-of-door decoration, had we the means of tracing it.

We can imagine, as constant labor for bare existence became less of a necessity, our grandmothers found time to look around and enjoy the beauty by which they were surrounded, and, admiring some of the wild flowers, may have transplanted them by the window to cheer their hours of labor. Then, as the log house gave place to the simple and still perfectly plain frame house with its increasing comforts, possibly the grandfathers may have begun to miss the shade trees that they had sacrificed in their haste to make space to raise food for their first pressing necessities. They found themselves obliged to plant small trees to replace those grand old forest trees and wait a good part of a lifetime for them to attain any considerable growth. Their wives and daughters, lending their aid and taste, may have planted the hollyhock, sweet william, jonquil, and possibly a few rose bushes, in beds each side of the door. These floral pets must still occupy a place close to the house, as there was as yet no fence to protect them, nor would they have looked well or flourished in the weedy, untrimmed turf around the house. Then followed the big, square, angular house, with its equally angular front yard, and the fitting accompaniment of regular geometrical flower beds, ungraceful in themselves, but preserving the harmony of the whole and the true exponents of the characters and tastes of their originators. And as neglect and slovenliness seem incompatible with straight lines and square corners we may presume they were well kept and weeded.

As wealth and culture increased they found visible expression in the artistic structures which the architect has fitted and accommodated to the growing social and domestic needs. The wide-sweeping and well-shaded lawns or close-cut grass plats constitute the most appropriate surroundings to such homes, and conspicuous objects of attraction on these grounds are the fanciful beds cut in the turf and the well-trimmed borders by the gravel paths and carriage drives. As the tall, irregular-growing perennials are in no wise fitted for such beds, if retained at all are consigned to the background, to be used where screens are needed or massed in large beds to be seen from the distance.

Lawn beds and borders require low-growing plants capable of being cut back and kept within lines. As their beauty depends on their being in contrast with the green of the lawns, we must have thickly-flowering or self-colored plants, and prominent among the latter are the coleus.

The coleus, being a tropical plant, requires hot-house protection during the winter. Very few people succeed in keeping them through the winter in the house because of varying temperature; for if sufficiently hot during the day, the temperature is too low during the night, they finally lose their leaves and die before spring; so that persons who do not feel like going to the expense of renewing them every spring from the florist are obliged to go without or may keep along a few scrawny specimens of the stronger growing sorts.

My admiration for this charming bedding plant induces me to offer some suggestions in regard to its culture and the feasibility of adopting them pretty generally for bedding purposes even by persons who do not feel like paying the full price for even an ordinary coleus bed every year. They are a very rapid growing plant and easily propagated, in fact it is the exception to lose even one cutting when put to root in the least favorable situation. So that if one could procure a dozen medium-sized plants of the florist as early as the first of April or as soon as it will do to start a hot-bed, you can cut the plants back, putting the cuttings to root, and the old plants will force more cuttings, as it takes but one week to root cuttings with ordinary bottom heat, these slips can be potted off by that time into small thumb-pots and sunk into the sand covering the hot-bed. In two or three weeks at most they will need topping and these can in time be used for a later set of slips to be in their turn rooted, and this will bring the second rooting no later than the second week in May. As coleus should never be set before the second week in June it leaves this last set of slips almost a month to grow before bedding out and there must have been slips on the old plants to have been rooted, so you can by this process get a large increase of plants by the time you are ready to set them. This is not as much like the milkmaid's counting as it might seem, for a friend has tried this method for several years with perfect success.

As there is some trouble attending the making of hot-beds I prefer a frame bed, heated by a small kerosene lamp, constructed after the following method. The frame which we have used for several years, and large enough for ordinary use, is sixteen by thirty inches, fifteen inches high in front and eighteen at the back. About half way from the top are nailed cleats to receive common roofing slates to form the bottom of the bed, on which are put two or three inches of wet sand. Bore a few small holes below the slate to supply air to the lamp, which may be very small. Fasten a piece of sheet iron just above the lamp chimney to distribute the heat. Cover the bed with a sash and set in a shady place. The first cost of this may be more than a hot-bed, but it has the advantage of being ready at any time when once made.

Then I would suggest making larger beds composed only in part of coleus, the center being made up of inexpensive plants of large growth raised from seed—ricinus, or castor bean, makes a fine large specimen plant for the center, surrounded by six or eight cannas, these in turn by zonale geraniums, of which most people have a good supply in the spring Outside of these coleus, which may have still another row of blue lobelia, which will show a line of blue mist during the whole summer in fine contrast to the green of the turf. Still other beds with the coleus plants set at some distance apart may have a matting of some low-growing fancy foliage or fine flowering plants of contrasting color forming an undertone. The matting planted in the spaces may be seedlings like sweet alyssum, white or blue lobelia, or anything that will form a close mass of color.

I know of a bed where the coleus were put at some distance apart at the setting, and then as they needed cutting back, as they must be to keep them of uniform size, the slips were set in the spaces and on the front edges, and before the summer was far advanced the bed was well filled, looking nearly as well as if set close at first. As the coleus can not be set in beds before June, these beds would be empty, unsightly spots on the grounds after the grass had started and everything else become attractive. Now these beds may be filled in the fall with spring-blooming bulbs that would be out of flower before time to set the coleus, or with pansies set in the fall or early spring. These beds would prove so attractive that there would be less danger of putting out the coleus too early, as is frequently done, to the detriment of the bed for the whole summer.

Not all of the coleus are of equal value as bedders when the beds are to be exposed most of the day to the full rays of the sun. The old velvety maroon variety called beschaffettii, the Spotted Gem, Golden Bedder, Black Prince, Burning Bush and Butterfly are among the best to grow in the full light, and least liable to fade, and will give a sufficient range of color to make a good-sized bed with a variety of plants. Then there are more delicate and brilliantly-marked varieties that must be grown in partial shade to insure success. The large-growing varieties will not do to set in beds with the slower-growing plants, but are fine for rustic baskets and lawn vases. The most satisfactory effect I have ever been able to get from planting coleus by itself was in a short border made up of a shaded line of four colors, the outside black, the next maroon, the third bright mottled and the fourth very light, this so situated that from the house we looked across it lengthwise and the colors blended and produced a much finer effect than the same varieties arranged in a circular bed similarly situated.

To the superficial lover of plants this method of propagation may seem too much trouble, but those who truly enjoy plants and their culture will find ample reward for the time and pains spent. Those who may not have a gardener to set and care for the beds and borders essential to the beauty of their grounds can comfort themselves with the knowledge that no plants, however beautiful and perfect, tended by another, can ever possess the interest and charm that comes with the personal acquaintance we must feel for every plant, when our own hands have supplied their wants.

After the reading of the above essays, a short time, only, remained for discussion. Mr. Atherton, Capt. Jordan, Miss Edgecomb, and Rev. Mr. Kimball entertained the audience with some pleasing remarks, and the meeting closed with singing by the Turner Grange Choir.

SECOND DAY. FORENOON.

PRACTICAL EXPERIENCE WITH SMALL FRUITS.

At the opening of the session on the second day, the Secretary read the following letter from Mr. I. C. Jackson of Vassalboro', giving his experience in the culture of the small fruits.

Dear Sir:—In reply to your letter of inquiry in regard to my experience in the culture of small fruits, I will say that in 1874 I commenced with the cultivation of strawberries, setting about one-sixth of an acre with Wilson, Col. Cheney, Green Prolific, French, Downer and Nicanor varieties. Soil, rocky loam and badly run out; put a little old manure around plants, when set. The next season, I sold $33.00 worth; have forgotten the number of quarts taken off and also the price received per quart. The same season, setting enough more plants to enlarge the piece to three fourths of an acre, and using no manure, except a crop of green oats plowed under the preceding summer. During the season of 1876 sold 1504 quarts at seventeen cents per quart. The cost of cultivation and winter protection was about $30.00.

Having sorrel, barn-grass, and honey-suckle to contend against, this is the only crop of strawberries in the nine years of my experience that I consider worth mentioning. Taking in consideration the cost of setting and cultivating on rocky soil, the weeding being done mostly by hand, as I grew them in matted rows; also the liability of late spring frosts when they were in blossom, and the cost of covering them, I do not consider them a profitable crop with me, though I think they would do much better on clay loam land.

In 1880 I planted one-sixth of an acre with Philadelphia Red Raspberry; also, about the same amount of land with Mammoth Cluster and Davidson's Thornless Black Raspberry. The land being in a fair condition, used but one shovelful of well-rotted barn-yard manure to the hill with the Red Raspberry, setting them two and one-half by four feet. With the Blacks I used no dressing whatever, setting them three by six feet. The next season sold ninety-six quarts Red and ninety-six Black, at fifteen cents per quart.

In the spring of 1882 I set an acre with Turner Red Raspberry and Brandywine, using the same quantity of dressing to the hill as before. Also, set three-fourths of an acre to Snyder and Taylor Blackberries, setting the last mentioned three by six feet, using no manure on land that was in fair condition. That season picked from the Philadelphia 320 quarts, and from the Black Raspberries, 288 quarts. If the Blacks had not winter killed, should have got double the quantity; received fifteen cents per quart for all.

In 1883, picked 285 quarts Red and 167 quarts Blacks; obtained from the one acre of Turner and Brandywine 224 quarts.

The Philadelphia was found to be too soft for market, and their color was not liked, being a very dark red. The Black Raspberries winter killed badly; had some difficulty in selling the berries, and therefore discarded both varieties.

In 1884, picked 1696 quarts from the Turner and Brandywine Raspberries, 320 quarts from the Snyder and Taylor Blackberry, and received twelve cents per quart for all.

The Turner is of good color, good flavor, an immense yielder, and an excellent berry for family use and the home market. The Brandywine is a good yielder, of good color, not so good flavor as the Turner, but very firm, and good for the home market or to ship. The Turner is early. The Brandywine is late, continuing in bearing two weeks after the Turner is gone.

The Snyder Blackberry, from some unknown cause, part of them, failed to make a good growth. I think, however, they were set rather too deeply; yet it has proved perfectly hardy, is early and a good yielder. The Taylor is nearly as hardy as the Snyder; is also a good yielder; season, medium to late.

The past season, 1885, picked 1792 quarts Red Raspberries, and 1152 quarts Blackberries. Of the three-quarters acre of Blackberries, but one-half acre was in bearing.

I paid two cents per quart for picking, each season, which is to be deducted. I have never kept any account of the cost of cultivation, either of raspberries or blackberries; have cultivated them about four times during each season, horse and cultivator doing about seven-eighths of the work until the last season, in which they did all the work, the ground being so well shaded they did not seem to need anything more. I have not used any dressing on any of them since they were set, with the exception of the past fall, when I gave them a liberal top dressing. I intend to set one acre of Brandywine and

Cuthberts in the spring; have a few Cuthberts. They are an excellent berry, large and of good flavor, and I think would be good for shipment. Season late.

Yours truly,

I. C. JACKSON.

Following the reading of Mr. Jackson's letter Mr. Arthur I. Brown of Belfast, a very successful commercial grower of small fruits, gave his experience in their culture and marketing, in the following interesting paper.

A TALK ABOUT SMALL FRUITS.

By ARTHUR I. BROWN.

When the Secretary of the Maine State Pomological Society invited me to read a paper before this body on the subject of "Small Fruits and their Culture," I gave a ready assent. It is the one branch of fruit culture on which I am enthusiastic and in which I take a keen delight. Particularly as to the blackberry, the raspberry, and the strawberry, which a few years ago were so plentiful, growing wild without care in the fields, the pastures, and in the forests of Maine. To-day in many sections they are well nigh extinct.

When I was a boy, many were the dewy mornings that I followed the mowers to glean the laden strawberry stems from between the swaths; many were the long still summer afternoons I spent in the back lot, beside the brook, and filled my little pail—and little stomach too—from the generous vines that flourished in the hollow that I knew and loved so well. The glamour of those days is on my spirit still, and the taste of those rich berries is something more than a remembrance.

I did not understand it then, but *now* I know that when the tired, sunburned boy reached home, his dear old mother's smile, her arms about his neck, her words of tender praise, were sweeter far to him than all the strawberries in the world. He thought in his little mind that mother was in raptures over the hard-earned fruit and he was proud. To-day he knows 'twas all for love of him, and he is prouder still. As my legs grew longer, I took longer excursions into the forests, over the hills, into all the remote places where wild berries were to be found. Always with the same keen enjoyment of freedom and beauty and stillness, with the same love for delicious fruit; and I am forced to acknowledge, the same vanity concerning my success.

Even after I became a man, it was my chief delight to leave behind all toil and care, and take a holiday in the forest. A basket well filled with berries was to me all that bags of game are to the hunter, or baskets of fish to the angler. In these midsummer excursions of mine it was a singular fact that when taken alone they were restful and soothing. Companionship destroyed the charm and made a dog of toil. Alone, did I say? No, not alone—Did not the flowers look up at me through dewy eyes of pearl? Did not the birds sing for me, the leaves whisper as I passed? Did not all nature speak to me in mysterious, sympathetic tones? Did not the trees bend low to read my thoughts and tell them to each other? In the midst of the woods there was a little meadow—russet with yielding moss and yellow with golden rod—like an enchanted lake within a continent of verdure.

The beach was white with wild clematis, and pale wild flowers gleamed like pearls upon its bosom.

> I see it again to-day, in fancy,
> Peaceful, still and sweet.

I see beyond it the old road made by the lumbermen. Long since the trees locked arms above it; and it seems a portal to the realm of silence and darkness. I enter. No sunlight penetrates this avenue except by stealth. The giant trees are hoary with the moss of age. The partridge whirrs away amidst the labyrinths. The noisy squirrel becomes silent, and, ensconced behind some sheltering bough, peeps out at me from his concealment; the blue jay cries in terror as he flies, and the solemn owl interrogates, who? who? Behind me the portal shrinks and fades. A good mile further on the straight road divides into crooked wood paths that soon lose themselves. I follow one a little and turn around a promontory of ledge into the head of a ravine where is a tiny spring. A carpet of soft, delicate green moss has here crept over every rock and every fallen trunk and every bit of earth. I lean against a tree and look in vain for any sign of man's invasion. I hear a gentle breathing among the leaves and feel a movement of the trunk as 'twere a pulse. Nearer to the peaceful heart of nature man can never come. This is the actual, the living forest. Down this ravine at every step the eye sees beauty. Every glen and grotto is decorated and hung with vines and ferns that are so delicate they wave without a zephyr and tremble even in this holy calm. As I advance it widens, the walls sink lower and are gone. Presently the sun glimmers through the tree tops, the long, dark vistas end in light and the forest is behind me. A path leads round a little hill to a forsaken camp. Tall thistles grow about the door. Decay has fastened on floor and walls and roof. Outside the glistening stumps stand, thick, like headstones, each showing where a giant fell. Wild raspberries are everywhere. The bushes have forced their way through every heap of brush, they bend in pity over every fallen, mouldering trunk, they fill the hollows, they fringe the outlines of the ridges. A new forest is springing up also. Vigorous saplings are pushing themselves into prominence with all the assurance of green youth. * * * * * * * Man and nature are ever at war. Here she is destroying the camp which he has built, and is rebuilding the forest which he has destroyed. He is active, she is patient: he is pitiless, she is merciful. But the ideal must yield to the practical till in the late afternoon I recline upon a bit of grass in the midst of this forest amphitheatre, my well-filled pails at hand, and watch the trees reach out their arms between me and the declining sun. The wild bee, drunk with nectar, sways past on his homeward way, the woodpecker taps upon the resounding trunk of yon dead tree. In the deeper woods the night bird calls his mate. I enter the dark aisles, the ravine, the labyrinth, the avenue; I cross the jewelled meadow, and finally emerge from the forest to see the last rays of the setting sun, shining on the roof and gables of the little cottage home upon the hill.

From this poor description of one from hundreds of expeditions, it may be seen that I naturally should turn my attention to the cultivation of small fruits. I have never cultivated large areas, but for some twenty years I have been experimenting on varieties, methods, and in detail. In considering the subject in its practical aspect I do not presume to instruct the nurseryman or the market gardener who are already large producers, but address myself particularly to the novice and to the amateur.

And first let me remark that fancy plots and showy arrangement, although very desirable from an artistic standpoint, are totally unappreciated by the plants themselves. They have nothing of the dude or of the exquisite in their nature. They require and will repay good cultivation, but whether for use in the family or for the market, they should be produced upon business principles. In general it is unwise for any person who depends upon the soil for his support to place sole reliance upon any one crop. Unforeseen contingencies may render such a course disastrous. In small fruit culture drought is most to be feared, and were I to engage in that exclusively I should first provide an abundant supply of water. Small fruits, especially the strawberry, are hard drinkers, and should be well irrigated if at all. A whole crop is sometimes cut off for want of water. At such times to him who can irrigate, a drought is profitable.

Now let us consider the blackberry. It delights in a moist, but not wet soil. Clay is too heavy and gravel too light. If possible, I would choose a place where the snow would lie evenly in winter and would not drift over the bushes. I should prefer a southeastern exposure, and that there should be a natural protection from north winds. The ground should be mellow, rich and free from sods. Nature may be the best guide in the selection of soil and location. I had a piece of land which had been cultivated as a garden for five years and in spite of plowing, harrowing, cultivating and digging, the wild blackberry bushes were determined to grow. I took a hint from this, planted it with blackberries and got wonderful returns. The choice of the best variety is of the first importance and must be settled by either individual or neighboring experiment. The loss of money, the vexation and disappointment that I have undergone has well-nigh discouraged me. I have been the prey of the peripatetic nursery agent.

He has beguiled my shekels; he has deceived me for lo, these many years. At last in utter desperation, I set apart a piece of land which I styled my experimental grounds and planted out several supposed-to-be standard varieties. Some produced small berries, some produced none, some were too intensely sour, some were coarse with large seeds, some had a core, others were fairly good, one, the Agawam, was excellent in every respect. I pin my faith entirely on that. Still I would not recommend it unreservedly to anybody outside my own vicinity. I have learned—what probably numbers of people knew before—that a variety which is unsurpassed in one locality may be quite ordinary in another. Different soil may have quite the same effect. I am informed that the Snyder is a grand good berry in Kennebec County. I should advise any one who contemplated planting a considerable area to experiment first with the Agawam, the Snyder and the Bangor, and choose the best from these. After finding out what is best suited to your soil, your locality, and your palate, it is well to plant out only that sort. There is a number of methods of propagating the plants. It may be done by cutting the roots into pieces some three or more inches in length and planting them in trenches. It may be done by cuttings, or by taking up the shoots that spring up near the parent stock. But these are matters for the nurseryman to consider. If you have settled as to the variety in your experimental grounds you can increase your area by planting pieces of roots or by taking up shoots. By the first plan you will get an abundance of plants but a crop of berries will come one year later than when the latter plan is pursued. The plants should be set out in the field where you propose to cultivate for berries as soon in the spring as the frost is out of the ground. The stalks should be cut off about six inches from the ground and the more roots it has the better, although they will grow with few. They should be set a little deeper in the earth than they stood before they were taken up and with the same side towards the south.

The earth should be put carefully about the roots and they should be extended in a natural position. Some set the plants in rows and some in hills. I have tried both ways. I shall hereafter plant in hills.

It is my opinion that after a piece of land is properly prepared and set to blackberries, it should be fertilized anew once in three years.

Pruning is very important. Success often depends upon timely and proper pruning. It is asserted that blackberry canes will not bear a temperature lower than 16° below zero. Perhaps many sorts will not, but many can be made hardy enough to stand the severest cold, of this latitude, at least, by *pruning*. Having attended to this properly, they need no further preparation for winter. The old canes may be cut out and burned any time after the fruit is off. Some say the sooner the better and quote the theory that a dying or dead branch is sustained with no less tax on the root than a live one. I have yet to learn that the time makes any difierence as far as the vitality of the bush is concerned. I should certainly remove them before the leaves show themselves in spring. A curved knife with a handle three feet in length is very convenient for this purpose.

Where considerable quantities are raised for market, picking in a careful and economical manner is very important. There are various plans, but the main thing is to have a system of some sort and improvements will suggest themselves. Women are the best pickers. If children are employed they should be divided into squads of three or four, each squad under the charge of a reliable person. Each picker should receive a ticket as each basket is picked, if the work is well done. If the berries have to be sorted, half tickets. Careless injury to the canes should be punished by discharge. The tickets should be cashed at night. Nothing has so good an effect upon employees as prompt, cheerful payment.

When your blackberries come into market, there are usually more or less wild ones; also pears, plums, peaches, &c., &c., in competition with your fruit, and when we consider that blackberries are comparatively perishable, it is seen that a near market is almost indispensable. I would not advise any one to attempt to raise them for sale who lived many miles from a city, unless they could avail themselves of rapid transit by rail. And even then there must be a special arrangement with some market man.

RASPBERRIES.

The cultivated raspberry, under proper conditions, is easy to be raised and is prolific. With me it is the most profitable of berries. I have one row six rods in length from which I have sold $70 worth in four years. They have the advantage over the blackberry in this way: they come into market just as the strawberry is going out and before other fruits are plentiful. They are preferable to the native berry in several respects. They are firm and good keepers. They may be picked before they are quite ripe and will ripen up in the baskets. They will not crush together, neither will they drip juice from the basket. They are free from maggots and spice bugs. It is asserted by some wise men that an insect has precisely the same flavor as what he feeds on, but one taste of a spice bug will refute that theory most effectually and emphatically.

Raspberries flourish best for me on a clay loam soil where there is good natural drainage. A stiff soil prevents the new canes from getting a good start in the spring. A location somewhat in the shade for a part of the day is advantageous. It is my opinion that those bushes which are fully exposed to the burning sun are more likely to rust. This is a disease of which I know but little. I have never had it injure my bushes except in one instance, to any extent. This was the last season, and as they were entirely without shade, I attributed it to that fact. I have had small patches in the garden affected, but of this I shall speak under another head. I consider a well-cultivated orchard to be a favorable place, as to shade—planted between the rows of apple trees. I think in open field culture that by growing in thick rows or in quite thick bunches, they will shade themselves sufficiently. I get the most berries and the finest from single rows beside fences. The other advantages of thus planting are, protection from winds, snow lying on well, and economy of space. The disadvantages are, the presence of weeds and wild raspberry bushes, which are worse than weeds, and the danger of snow-drifts breaking down the canes as the snow melts away in spring. When I am about to put a row beside a fence I spread on a good coat of manure and turn furrows towards the fence, the first as near as possible. I plow five furrows in all; the outside furrow is cut up and spaded over between the first furrow and the fence. I then spread on more manure and harrow it thoroughly, and clear out the last furrow with a spade. This work is done in the fall. Early in the spring I plant my canes. As I raise them myself and have a plenty I put them in one straight row only one foot apart. If I bought the plants I presume I should put them three feet apart. By planting closely I get a strong hedge one year sooner, and consequently berries in proportion.

In the choice of variety there is but little need of experimenting. There are many kinds of red, besides the orange, the white and the black. The black caps are not a satisfactory market berry, nor are they the best for the family table. The same may be said of the orange and of the white. There is considerable difference in their flavor and some people prefer the one or the other. The orange has a strong rich aroma and a peculiar taste much relished by a few. The white has nothing particular to recommend it to my fancy except that it is ornamental when a few are mixed with the reds in baskets for sale or upon the table. I raise the reds exclusively, both for profit and for use. The weight of testimony in this State is in favor of the Turner for an early sort and the Cuthbert for a late sort. These are hardy, prolific and of good quality. It is hardly worth while to pay big prices for the fancy sorts which need so much puffing to make them sell.

I run the cultivator along about the twentieth of May, to stir up the weeds and again about five days after. I then sow dandelion seeds and hoe during the summer. Sometimes I plant beans instead of dandelions. Either gives me a paying crop the first year and the dandelions will pay better the second year than the first. Strawberries will do first-rate also. Plant a late sort and the snow lying on will keep them back somewhat and you will be in the market after others have withdrawn. In open field culture I plant in rows five feet apart. I put the plants one foot apart and let them multiply until I get quite a hedge. I prepare the ground as I would for blackberries. I usually plant beans, &c., on the same ground the first year. The crop often pays for the use of the land and care.

Raspberry canes need a support in the fruiting season. Without it the weight of berries and the foliage with the dew or rain causes them to fall to the ground where the fruit gets soiled and the later blossoms are blighted. They also need support in winter. Raspberry canes are weak and break down easily under weight of snow. Where but few are cultivated for home use it is easier to plant in hills and tie up each hill to a stake with wool twine or any other soft string, closely for wintering and loosely for the fruiting season. When planted on a larger scale and in the hedge-row system, I have tried a number of plans. I first used a line of wire on each side of the row. This is by far the cheapest support. I found that where the canes rested heavily upon the wire they were subject to rust. I have discarded that method on that account. I think the safest and best way is to nail small round poles to a line of stakes on each side of the row and tack laths across at intervals. I have this year a very strong growth of canes and have gathered them at the top into compact bunches and tied them with twine on a piece set one year ago last May, and not yet thickened up to a hedge. Most varieties of this berry, like the blackberry, throw up new canes from the root. The black cap is an exception and must be layered.

I presume it is understood by all that canes never bear but once, and of course upon the vigor and numbers of new canes produced in any one year, depends the next year's crop. The old canes should be removed. When to do this is a disputed point. The correct theory is to do it as soon as the fruit is off. Unless the new canes are very stocky and well supported, the old ones are a stay and support to them and for that reason I usually take them out after the snow is off in the spring. Like the blackberry, successful wintering and a good crop next year both depend very much upon the time and manner of pruning. No definite rule can be given to meet all circumstances. It depends upon the season, whether wet or dry; upon the situation, exposed or sheltered; upon the rapidity of their growth. I will say, however, that I should not allow them to grow over two feet high the year they were set. In succeeding years not over three and a half feet. Sometimes it is necessary to prune twice if the growth has been very rapid and exuberant. Pruning is a simple matter, merely pinching the crowns of the new canes. I use hedge shears for the purpose, but pinching with the thumb and finger just enough to stop the upward growth is better for the canes, but cannot be done so rapidly. If after this they throw out side branches, these should not be allowed to grow more than a foot in length or even less.

Some varieties, notably the orange, are not hardy and to ensure wintering they should be bent down and covered lightly with earth or litter. If this be done one person should hold them down while another plies the spade until the earth will hold them.

Picking, &c., should be managed the same as with blackberries, and with a near market, the right kinds, honest measure, and an inviting appearance of your wares, you have nothing to fear from an abundance of native berries. I have sold large quantities for ten cents a basket when natives were a drug at six cents. In fact, I have never yet been obliged to sell for less than ten cents, although strong competition in cultivated berries would run down the price.

Evaporated raspberries are becoming a standard article of commerce. The supply is entirely inadequate for the demand. In New York State tons of them are prepared and sold every year (one man has ninety acres), yet they seldom if ever find their way into Maine, even as a novelty.

It is probable that the demand will grow faster than the supply increases for many years. Our State is well adapted to this business. In the first place the raspberry is natural to the latitude and especially so to the soil. It is a business in which our young people can engage. But a comparatively small area is needed. Ten acres or even five is sufficient land on which to carry on quite a large business. The plants to set one-eighth of an acre can be bought for a small sum of money, and from them in two years sufficient stock can be obtained to set five acres at least. This two years of waiting need not be lost, because that time is necessary to properly prepare the field for the plants. If judicious management be practiced, the crops for the two years will pay for all the labor of preparation, and for nearly all if not the whole of the manure. A good evaporator will cost but little more than a first-class mowing machine. There is no doubt but that a good article put on sale in an attractive package will make a market for itself. Not many years ago celery had a very limited sale, but as people have gradually become accustomed to its use, the consumption has rapidly increased, and it is now looked upon almost as a necessity. If this be true of celery, what a vastly greater demand is certain to spring up for evaporated raspberries. Gregg's Black Cap is found to be the best for this purpose. It contains less water, and its color is favorable in many aspects. I have had no actual experience in this branch of fruit culture. I have been giving simply my opinion. I wish the business might be investigated, written up, talked up, and inaugurated in Maine, if there is any money in it.

STRAWBERRIES.

A friend of mine, a physician, has three hens. They are of a good breed, young, well fed, and well cared for. The gross returns which my friend receives from those hens are enormous when compared with the outlay. He knows just about as much about the poultry business as a science, as I know about the cerebro spinal meningitis, yet it is his real desire to give up his practice and enjoy an income of $3,000 a year from 1,000 hens. If one doubts his ability to make that amount he will triumphantly call your attention to his three hens and what they are doing. The strawberry business is somewhat like the poultry business in this particular; it is very easy to do a small business, but the men or women are few who can make a pecuniary success of a large business in either line. I know a lady whose health required out-door work, who sold $49.77 worth of strawberries in one year, from six square rods of land. Hers is not an exceptional case by any means. A showing even better may be made, under the best possible conditions and with the best possible care.

And this is the whole sum, science and philosophy of the matter of strawberry raising. My first attempts were the most successful, partly because I happened to start under favorable conditions as to soil, variety, &c.; mainly, because I gave them good cultivation. Since then I have scored several magnificent failures, and to-day I know less of strawberry culture, in my own estimation, than at any other period of my life. I can endorse Josh Billings, who said, "It is better for a man not to know quite so much, than it is to know so much that isn't so." There are so many points to be considered, so many problems to be solved, and so many successes on record, achieved under widely different culture, soil, climatic influences, &c., that nothing less than a strawberry growers' convention can grapple and elucidate all these matters. I can at best but briefly glance at a few points, and at the most what I have to say should be considered simply as the opinion of one not competent to be deemed an authority.

One must not expect to succeed in this business without the aid of experience. Theory is good as far as it goes, but one's competitors are almost sure to have both. One must study and learn by the light of small ventures, afterwards a gradual extention may be profitable. It is well to take the first lesson from nature herself. Where wild berries grow abundantly it is safe to expect the cultivated to thrive. We will suppose we have such a piece of land in grass. I should mow before any seeds were formed. When plowed, I should want about six inches of the field turned exactly bottom side up. I should spread on a liberal dressing of manure, at least twenty cords to the acre. This should be well worked into the soil in the fall. In the spring, plant early sweet corn for the family, and between the hills set the strawberry plants, a sufficient number. Give thoroughly clean cultivation during the summer. Cut up the corn-stalks as soon and as fast as you use the corn. Do not try to keep the same plot in berries more than three years.

After getting started, plant a plot each year and plow up those that are getting weedy. This, of course, applies to those who have plenty of land. If one has but a garden there is nothing equal to the hoe, the hand weeder and elbow grease, for the weeds must be exterminated and you must fight it out on that line if it takes all summer and every summer.

That the cultivation of small fruits for market is a profitable business in the hands of an experienced culturist, there is no doubt. In our good State of Maine we have the natural home of them all. Nowhere are the bushes and the vines more fruitful. Nowhere does the summer paint the ripened fruit with so true a hand. Nowhere does her laboratory combine more exquisite flavors. I believe that our people may become pre-eminent in this department of pomology. But I will not lay undue stress on this. Rather would I urge upon all the ease and cheapness with which an abundance may be provided for the home table. I *know* by experience that blackberries and raspberries can be produced and picked for two and one-half cents per basket, and that as many bushels of strawberries as of potatoes can be raised on one square rod of land.

They are all luxuries, unquestionably and emphatically. We, in the country, have within our easy grasp what is hardly to be had in the city at any price, if we take into account freshness and perfection. The farmer owes it to himself and family that they have the best and a plenty of what his soil will yield. As a class we are quite apt to feed the pocket at the expense of the stomach, the intellect, and the soul. Our farms offer too little that appeals to the taste and to the fancy. It is not the hard labor of the farms that drives our boys from home. They are ready to work harder in the city. Until our surroundings, plenty, variety, comforts, and all that tends to approximate the ideal and practical sum of rural happiness outweighs the novelties, allurements, fascinations, tinsel and glare of city life, this exodus will continue.

In urging the claims and desiderata of small fruit culture upon your attention, I feel that I am urging the taking of a step in the right direction.

An unprejudiced observer sees too many homesteads rich in ample domain and half-filled fields, too many circumscribed desires for beauty, too many tables bare of fruits and flowers, and has a sigh of pity for the poverty that pays such goodly taxes. Our homesteads all should be worthy of our valleys, of our mountains, of our people. We should center these things sweet to eye and ear, to soul and sense. Things that shall draw and hold the affections of both young and old, by tender ties which they shall never wish to break. The Maine State Pomological Society is doing wisely and well its appropriate work in hastening the advent of that perfect day. From the progress of the past it may find abundant hope for the present, and an earnest for the future.

Next on the programme was,

"WHAT MAN HATH DONE, MAN MAY DO."

By D. H. Knowlton.

For over fifty years my father spent his life on the old farm first settled by my grandfather. Here he erected buildings for a home. They were model farm buildings, and into the old substantial farmhouse the sun darted his rays of light and shone unobstructed by shade trees or shrub. When I was a small boy the old farm was sold and a new home on the main street of our pleasant village was purchased. In front of the house there were three large elms spreading out their graceful branches, but my father wanted as many trees as any one along the street and accordingly set out a tree in every available spot, so that in a few years there was a dense mass of foliage on every hand, and what little sunshine gained admission to the house had a struggle for a passage through the shade trees. Just why it was my father after spending his earlier life in sunshine, so much desired the shade, I never knew.

Had it been in these later days I should think possibly he had been reading Dr. Loring's addresses on forestry, or studying the reports of the Agricultural Bureau upon the same subject. Here for twenty years or more I lived in perfect content. It was home to me and a good one, too, but as the years rolled on I became a husband and father. Feeble health of wife and child led to the formation of new plans; vacant lots were examined and the one upon which the sun shines from his rising in the morning till his setting behind the hills was selected as the site for our future home. Well, the next spring we were settled in a new house on a lot anything but promising for a fruit garden, and here, in the spring of 1879, properly begins the narrative of fruit culture I am about to offer for your consideration. I have given you this much in detail as a preface to my remarks, because in thinking over what I have accomplished in these few years my mind invariably goes back to the beginning and the causes which led to it. You will pardon me in the frequent use of the *ego* in this paper. It is so closely connected with all the work done I cannot help it, and because of this fact, it is my hope that to some, at least, this paper may prove the more helpful, for "What man hath done, man may do."

THE BEGINNING.

The acre of land of which I am to speak is on a hill-side overlooking the village and a beautiful river valley. To the north of it is a fine grove of deciduous and evergreen trees, while the general surface slopes gently with a southerly exposure. The soil for the most part is a rocky loam, but along the southerly edge it is boggy and wet. For half a century it had been a mowing field, half cleared of stones, and not to my knowledge had it been dressed for years. The grasshopper year, as we call it, a man attempted to cultivate a portion of it and gave it up in disgust. It produced little grass, in fact was run out. The ground was very stony and to this day I have not succeeded in clearing the soil so as to run a plow or even a hoe without frequently hitting stones.

The situation was this, in short, the upper portion was stony and dry, the lower portion was mucky and wet. Upon this land, years before, some one had set a few apple trees which had been browsed by cattle and received no care, and were as scrubby as any pasture trees you ever saw. So far as apples were concerned we decided to buy no trees until we knew the varieties we wanted. The same was true in regard to the setting of scions. We knew we wanted a King Sweet, a Red Astrachan, a Deane, a Fameuse, a Winthrop Greening, and we also decided to set a Talman Sweet, a Black Oxford, and the rest in Baldwins, Rhode Island Greenings and Roxbury Russets. Several of the trees we decided not to graft the first season, hoping they might prove to be desirable fruit. Our object in view in this matter was to supply the family with fruit of good quality, for I must say we hadn't at that time the remotest idea of raising more apples than we could consume under our own roof. At the trees I went with my saw and knife and some of them looked lonesome and homely enough. A neighbor advised us to cut them down, but we concluded to prune closely to save life and not to destroy by uprooting. A portion of the land was plowed the first spring. Oh! how the stones stuck out along the uneven furrows, and when the horses got down to the lower part they sank down deep into muck. The stones, however, proved to be just what I needed, for I began to collect them in heaps and then to wheel them to the wet land where the muck was dug out, the stones thrown in, and outlets made to the roadside drain to carry off the standing water. This method I have continued since till all the wet and boggy soil became arable, and it is now the most fertile portion of the garden. The first spring I set, also, a few strawberry plants of an unknown variety, and started cuttings of currants and grapes. I was fortunate enough to secure some very good bushes of Houghton Seedling gooseberries, though at the same time I was unfortunate, as all are likely to be in buying fruit trees, for several of them when fruiting the second year proved to be natives and had to be dug up. Other than the ordinary cultivation of vegetables with which the garden was planted this represents the first season's struggles. The results, however, were notable, for the apple trees with the new culture they were receiving began to grow vigorously, and one or two even had the courage to blossom and bear some specimens of fruit. One of these I must speak of here, for I know of no autumn fruit that has more excellent qualities for family use. I refer to the Munson Sweet, an apple that is good to cook early, and may be served in a variety of ways very acceptably and when ripe is an excellent dessert apple. It deserves a place in every family fruit garden.

THE SECOND YEAR'S WORK.

The second year more scions were set, but only one new variety and that the Cole's Quince, or rather a local variety of special merit, originated by Capt. William Russell of our town some fifty years ago. A few New York trees were bought of a neighbor who had set them too thick on his lot several years before. They were bought for Northern Spy, but all with one exception proved to be Ben Davis and the exception was a Pewaukee. The Ben Davis bore the next season and have continued to bear each year since, rather more of that variety than we could consume in the family. Last year, however, I sold the surplus for $1.40 per bushel, and this year I find they are now worth 25 or 50 cents more to the barrel than Baldwins or Roxbury Russets. From this outlook I shall not re-graft the trees at present. The currant suckers, having taken root, were set in rows and made a fine growth, but were not large enough to bear. The gooseberries, however, did bear some, enough for me to discover the natives. Several pear trees of selected varieties were set and all grew well during the season. Small beds of strawberries were set, Charles Downing and Crescent Seedling, which made a fine growth. Blackberries of an unknown variety were set with great hopes. These made a splendid growth, but the winter killed them back nearly to the roots and the second season the same process was repeated. They never produced any good fruit and were dug up. Clarke raspberry bushes from stock that had been growing in the vicinity for several years were set and from these the next year we got some fruit, just taste enough for us to want more. The third year they bore quite a good lot and we decided we could raise them. Several grape vines were set and grew well. There was also set an unknown variety of black caps, which the second year began to bear some. The fruits of the second year were strawberries, a very few gooseberries, and more apples than the first year.

OPERATIONS THE THIRD YEAR.

The third spring more scions were set, especially in the trees grafted the two previous springs, so that in some cases the trees were entirely grafted. More grape vines were set from cuttings of the Delaware, which were rooted the year before. Strawberries were also set for next year's fruit and the soil generally well cultivated. A few cherries, a pomegranate, Russian Mulberry and one or two plums were also set out. Of the Russian Mulberry, I may be permitted to say a word, since so many of our nurserymen are widely advertising it, and every tree agent you meet urges you to buy it. It has made a slow growth and at the present time is not more than four feet in height, and I have given it a good chance to establish a reputation. It grows slowly and after several years of cultivation has borne no fruit. From my own experience and what I read of it, it is of no earthly value in Maine. It was sold by Purdy's announcement and I cannot refrain from urging others in Maine to let the Mennonites raise the mulberries. The fruit crop this year began with strawberries, of which we had quite a surplus after eating an abundance ourselves. There was a small bed of Downings, as beautiful a sight as I ever saw in any fruit garden. As a curiosity the product of this bed was carefully measured and it was found to produce fine berries at the rate of two hundred bushels to the acre. The apple trees bore more than the year before. The currants and gooseberries also produced fruit and we had all we needed of both. For several weeks in small amounts we had most excellent raspberries, though not as many as we wanted. There were also a few black caps, which for the lack of better berries seemed very good.

THE FOURTH YEAR AND ITS FRUITS.

The fourth spring more work was done upon the apple trees, a few being grafted and a few new trees being set. We were now ready to try some more raspberries and blackberries; of course we kept up our strawberry beds, for we couldn't do without them after the family had enjoyed them for two years. We ransacked the books, catalogues and papers to learn the hardy varieties, and of black caps in the spring we set both Gregg and Souhegan, as well as some Early Harvest blackberries. Early in the autumn we cleared a strip wide enough for four rows of bushes on the easterly side of our lot, a little less than fourteen rods long. The ground was well manured, thoroughly plowed and harrowed. Here we set one hundred bushes each, of Turner and Cuthbert raspberries and Snyder blackberry. These varieties were selected for earliness and hardiness, two very essential qualities in producing the fruit successfully. They were set as early in the fall as the stock could be obtained from a New Jersey nursery. People as they drove by wondered what I was doing there in the fall. I remember telling one man I was getting ready to plant beans, which was not very far from the truth, for I raised two crops of beans among the bushes the next two years. I didn't wish to know his opinion had he been told I was setting raspberry and blackberry bushes in October. Even my own family were skeptical, but now they all admire and enjoy that beautiful hedge of fruitful shrubbery.

This year we had two or three barrels of apples, a surplus of strawberries, currants and gooseberries, some fine samples of grapes, and a few pears. There were also picked from my old raspberry bushes some excellent berries, which with Jersey cream made just the sort of relish we all enjoyed, in fact it was so popular there were no berries to sell.

THE FIFTH YEAR'S FRUITS.

The next season's work was similar in its nature. The scrubby apple trees upon which we commenced five years previous were growing rapidly, and fine thrifty trees with well-shaped tops were the result. Several grape vines were set, Brighton, Moore's Early and Virgennes. The shrubbery of all kinds was doing finely. The raspberries and blackberries set the fall before wintered well and started early in the spring, and during the season made a fine growth, though I did not allow any of them to grow more than two feet and at that not more than three or four canes to the plant. I had a few strong Downing strawberry plants. These were carefully set early in the spring and bore before the season ended some very fine fruit. My experience, however, has taught me that for garden culture, at any rate, there is more profit in setting the plants as early in August as they can be obtained, and I have lately followed this plan with success. A crop of peas or early beans may be grown from the same land and the following season the vines under favorable conditions will bear a good fair crop of berries.

This year we had apples the entire year, a surplus of strawberries, currants and gooseberries, which found a ready market. There were also enough raspberries for the family and a few Snyder blackberries from bushes of which we have made no mention. There was also quite a lot of grapes, some pears, and promise of still more fruit the next year.

HOW THE FRUIT CAME IN THE SIXTH YEAR.

The sixth year very few additions were made, though here and there a bush, tree or plant was set out. There was in fact no need of it except to keep up the strawberry beds. This we did by setting plants in the summer as soon as the new plants were of sufficient size.

There were several barrels of apples and all the other fruit needed in the family. The raspberry and blackberry bushes passed the second winter finely and before the season was through formed four compact rows of shrubs as fine as one could wish or expect under the most favorable circumstances.

SMALL FRUITS FOR THIRTEEN WEEKS.

We come now to the seventh and last year of which I shall speak. These details must be wearying to you, but other than some of the discouragements of which I propose to say a word or two later, they portray the work of fruit growing in a one-acre garden. This year was the most fruitful we had had because vines, shrubs and trees were in the best condition for fruit. The first strawberries were gathered the 25th day of June, and from that day to the 20th of September there was not a single day when small fruits of some kind were not abundant in our garden; and permit me to say here that twelve or thirteen weeks' time is none too long for the enjoyment of these luscious fruits. The apples, of which there were about a dozen barrels, will cover the year finely. The great triumph of the season, however, was the magnificent crop of raspberries and blackberries. Early in the season the Turners began to bloom, then the Clarkes and Cuthberts, and shortly the Snyder blackberries were a mass of snowy whiteness, surpassing in modest beauty the most gaudy flower beds. As the season advanced they were marvels to behold, and an astonishment to all who examined them. From tip to base of canes every available bud was utilized by the berry clusters. Loaded down as they were from the first they matured an abundant crop of fruit, which in quality was of unsurpassed excellence. While the raspberries, commencing with the Turners, ripened far more fruit than any of us had ever anticipated. There was no longer questioning by the passers-by as to what these bushes were, or whether they were expected to bear fruit; they bore their own testimony so that all could see and learn the lesson they taught me, which is that these fruits may be successfully grown in Maine.

During each year the garden produced all the vegetables used by our family, with the exception of potatoes, while the fruit trees seemed to grow all the better for the culture.

PLEASURE AND PROFIT IN FRUIT CULTURE.

At first and even to this day having in mind only the pleasures of cultivation and an abundance of fruit for the family, the work of fruit culture has been carried on from year to year. So responsive are all the fruits to good cultivation that during the past few years there has been a liberal surplus for sale, which kept the sugar barrel filled and increased the children's bank accounts. We have been surprised all the way along to note how quickly one may raise an abundance of fruits for home use, and when your genial Secretary very kindly invited me to prepare a paper for this occasion, I did not hesitate, for I knew that a simple recital of seven years' work would be an easy matter and, best of all, might prove helpful to hundreds of others who are ready and eager to raise fruits for the home, if only the difficulties are not too great. Engaged as I am in business, where every moment of time is valuable, where there is a constant strain upon the nerves, all my thoughts are at work, I stole away the time necessary to carry on my garden, doing with my own hands the larger part of the labor, and to-day I stand before you here in perfect health and strength, knowing that without my garden recreation many of my business duties would have to be laid aside and possibly myself a prematurely old young man. Then, again, working in the open air, cultivating flowers and fruit, my family are in better health than seven years ago, knowing, thank God, that our health and strength have been improved by living in His sunshine and feasting upon the good things He has so wisely placed within the reach of every man who controls a few rods of land in this good old State of Maine.

FOUR ESSENTIALS IN MAINE FRUIT CULTURE.

Before closing I wish to summarize what in detail I have spread out before you. The *essentials* of fruit culture in Maine are not very many and are within the control of most.

First. Any location where corn or potatoes will do well will produce fruits. Our own notion is, however, that the location should be near the house and, if possible, where the wind will neither blow the snow off nor pile it up in drifts. If the soil happens to be wet it must be well drained, when the results are likely to be just as good.

Second. It makes very much difference what kind of culture the soil receives. There is really very little danger of making the soil too rich by dressing liberally with barn-yard manure, so far as possible working it thoroughly into the soil. If, however, there are fertilizing elements that are particularly called for in fruit culture they may be found in bone meal and wood ashes. When these are properly applied to most soil we doubt if very much more is needed to insure all the nature of the plant, tree or shrub may call for. But cultivate thoroughly if the best results are desired.

Third. It takes a long while for us to learn from our own experience that we can not accept as authority in fruit matters in Maine writers and fruit growers whose experiences are wholly in other States. It is therefore important, in fact, essential to fruit growing in any part of Maine that we have the best varieties, not perhaps the most talked of, but those that are hardy enough to endure our climate and early enough to be out of the way of frosts in the fall. One of the most profitable grapes for New York State is the Concord. I had two fine vines but I cut them both to the ground last fall, and in future will have no vines that do not mature their fruit earlier than the Concord. A glowing account of the excellent qualities of the Early Harvest blackberry induced me to try a few bushes. Twice in succession they have been killed to the ground and next spring they will come up root and branch and be "cremated" in the annual bonfire.

The *last essential* of which I will speak is pruning, for very much of success depends upon the skill and certainty with which it is done. Pruning will supply nothing to the soil or plant, but unless the plant growth be controlled or directed we shall not accomplish the objects sought. The plant will be less hardy and the fruit of inferior quality, but direct the energies of the plant by pruning to the production of fruit and if there be food enough within its reach you may count on a delicacy of flavor equal to fruit grown in any section of the country, while in quantity the fruit will be limited only by the capacity of the plant. Let the strawberry runners grow and you will have a dense mass of foliage and imperfectly formed fruit of inferior quality. Let the blackberry and raspberry bushes grow at random and ten to one the cold will kill them back, and if there happens to be fruit it will be of irregular form and inferior flavor.

POSSIBILITIES OF FRUIT CULTURE.

Having spoken thus of the necessities I will now call your attention to the possibilities of fruit culture, showing what in the writer's experience may be done by any one here in Maine in a few years—in other words, formulate what any farmer or gardener may expect from fruit growing in the way of product each year—and for this purpose I will commence with the fruit that requires the least time.

The Strawberry. If one is fortunate enough to get strong, local-grown plants in the spring they will produce some berries the same season, though the rule is, the following season will be the most productive, and having once started a bed there is no need of ever being without the delicious fruit. By using potted plants in late summer a fair crop may be raised in ten months and a good crop from same vines the next year.

Raspberries and Blackberries will require two years growth before they will produce very much fruit, after which crops may be expected for five or six years and perhaps longer.

Currants and Gooseberries grow rapidly, and when good, strong roots are used will bear some the third year—and for years after. When cuttings are used it requires two or three years more.

Cherries and Plums are not likely to bear much under four or five years, and I imagine it is more likely to be more than less.

Pears I do not know very much about, though dwarf trees of some varieties will bear in three or four years, but if the trees are standard it will take a year or two longer, in some cases ten or a dozen years and sometimes more.

Grapes, when good, strong vines are set, will begin to bear the second year, and after the third and fourth years will usually bear quite heavily.

Apples. In my own case scions commenced bearing the third year, so did some very small apple trees, though they are the much abused Ben Davis. We cannot expect much from grafts of our own setting in less than five years, while from trees set the time of bearing will vary much in the different varieties, but with good stock and good culture apples may be expected in from five to ten years.

The possibilities assure us then as we have shown that in from one year to ten, any man may have a succession of large and small fruits in abundance for home use, and, if he chooses, a surplus for market. Under these circumstances it seems an inexcusable neglect that so few of our farmers permit themselves and their families to be deprived of all or even a part of these health-giving luxuries. In my opinion they cost less than drugs and are vastly more beneficial.

DIFFICULTIES OF FRUIT CULTURE.

Perhaps you may infer from what I have read you that there have been no obstacles in the way of fruit growing on my acre lot, but I can assure you there have been a great many. The sunny hill-sides protected from the cold north winds suggests to the passer by that the location is splendid. But because of its favorable position hordes of insect pests seem to gather there from miles around. The curculios have taken all my plums thus far, the borers have killed several of my apple trees, the currant worms have made their presence known not only in the springtime but all through the summer, the codlin moth knows where every one of my apple trees is and they seem to enjoy leaving their hidden retreats when I am slumbering and when the fruit falls from the tree, I find the evidence of their mischief within the core; the *Trypeta pomonella* tunnels its way through my best sweet apples and early fruit, the white grub worm beneath the surface eats away at the roots of the strawberry plants, and the first intimation I have of his presence is the death of the plant. The robins have eaten my cherries and something kills my pear trees. Don't for a moment allow yourselves to think success in fruit growing is assured to any one without labor and constant care, but the fruit more than pays us for our labor in the pleasure and health it gives. I always thought Farmington was an exceptionally good and virtuous town, and I am happy to say that during my seven years of fruit growing to our knowledge nothing has ever been stolen from the garden. In other places many have suffered from thieves and lost their best fruit. The boys know where my garden is, they know it contains fruit when there is fruit anywhere; there are no watch-dogs about the premises, neither is the lot surrounded by a "spiked fence," the children, too, know, for many of them visit us and play around among the flowers and fruits, but somehow, for some reason I know not, unless it be in the general excellence of their moral training, they have honored our possessions and permitted us to enjoy the fruits of our labor.

One of the most delightful books I ever read is Warner's "My Summer in a Garden," and thinking you may enjoy some variation from my monotonous notion of fruit growing, I will read, in closing, a few paragraphs of *his* experience.

"There would be no thieves if there was nothing to steal; and I suppose in the thieves' catechism the provider is as bad as the thief; and probably I am to blame for leaving out a few winter pears, which some predatory boy carried off on Sunday. At first I was angry, and said I would like to have caught the urchin in the act; but, on second thought, I was glad I did not. The interview would not have been pleasant. I shouldn't have known what to do with him. The chances are that he would have escaped away with his pockets full, and gibed at me from a safe distance. And if I had got my hands on him, I should have been still more embarrassed. If I had flogged him, he would have got over it a good deal sooner than I should. That sort of boy does not mind castigation any more than he does tearing his trousers on the briars. * * *

"I found a man once in my raspberry bushes, early in the season, when we were waiting for a dishful to ripen. Upon inquiring what he was about, he said he was only eating some; and the operation seemed to be so natural and simple that I disliked to disturb him. And I am not very sure that one has a right to the whole of an abundant crop of fruit until he has gathered it. * * *

"A child is curious all over, and his curiosity is excited about as early as his hunger. * * * Perhaps this fact has no practical relation to gardening; but it occurs to me that, if I should paper the outside of my high board fence with the leaves of the Arabian Nights, it would afford me a good deal of protection,—more, in fact, than spikes in the top, which tear trousers and encourage profanity, but do not save fruit. A spiked fence is a challenge to any boy of spirit. But if the fence were papered with fairy tales, would he not stop to read them until too late for him to climb into the garden? I don't know. Human nature is vicious. The boy might regard the picture of the garden of Hesperides only as an advertisement of what was over the fence. I begin to find that the problem of raising fruit is nothing to that of getting it after it has matured. So long as the law, just in many respects, is in force against shooting birds and small boys, the gardener may sow in tears and reap in vain.

* * "You buy and set out a choice pear tree.* * At length it rewards your care by producing two or three pears, which you cut up and divide in the family, declaring the flavor of the bit you eat to be something extraordinary. The next year the little tree blossoms full, and sets well, and in the autumn has on its slender, drooping limbs half a bushel of fruit, daily growing more delicious in the sun. You show it to your friends, reading to them the French name, which you can never remember, on the label; you take an honest pride in the successful fruit of long care. That night your pears shall be required of you by a boy! Along comes an irresponsible urchin, who has not been growing much longer than the tree, with not twenty-five cents' worth of clothing on him, and in five minutes takes off every pear, and retires into safe obscurity.* * * The boy goes on his way—to Congress or the State Prison, in either place he will be accused of stealing, perhaps wrongfully. You learn, in time, that it is better to have had pears and lost them than not to have pears at all. You come to know that the least (rarest) part of the pleasure of raising fruit is the vulgar eating it. You recall your delight in conversing with the nurseryman, in looking at his illustrated catalogues, where all the pears are

drawn perfect in form and of extra size, and at that exact moment between ripeness and decay which it is so impossible to hit in practice. Fruit cannot be raised on this earth to taste as you imagine those pears would taste. How you watch the tender twigs in spring, and the freshly-forming bark, hovering about the healthy young tree with your pruning knife many a sunny morning. That is happiness! Then, if you know it, you are drinking the very wine of life; and when the sweet juices of the earth mount the limbs, and flow down the tender stem, ripening and reddening the pendent fruit, you feel that you somehow stand at the source of things, and have no unimportant share in the processes of nature. Enter at this moment boy the destroyer, whose office is that of preserver as well; for, though he removes the fruit from your sight, it remains in your memory immortally ripe and desirable."

AFTERNOON SESSION.

The meeting was called to order at 1.30 o'clock, President Pope in the chair. Mr. W. P. Atherton was introduced, who read the following essay.

THE CLIMATIC LINE OF FRUIT CULTURE IN MAINE.

By William P. Atherton.

What is climate? What is climatic influence, and is there any climatic line to fruit culture in Maine? In the discussion of this subject I shall not go into the origin of species. If, however, I should be asked, "what determines a variety, climate or soil?" I should say neither; they are determined by a higher law and these are but accessaries to modify or develop the species itself. We know that the earth is continually changing, that some forms of flora that once existed exist no longer because the conditions necessary to their life and growth are wanting. Still, much of the magnificent flora which graced this continent lies buried in our mines in a condensed combustible form which gives warmth to our dwellings, speed to our engines and whirls a million spindles.

But the question is, What is climate? I answer, it is the condition or state of the atmosphere in which we live as regards heat and cold, moisture and dryness and the amount and durability of the same. In England we say they have a moist climate because of the surrounding seas, the ocean currents and the frequent and long-continued fogs. Here in Maine we have a colder, dryer and more changeable climate, due, perhaps, not so much to the elevation and depression of the land as to the vast bodies of ice constantly floating near to our northeastern coast, and to the steady cold northwestern winds. In Florida they have a more equable climate, except in rare instances like the present winter when the thermometer runs down to almost zero, freezing oranges on the trees and the ground to the depth of eight or ten inches. What is climatic influence? I answer, it is that state of the atmosphere which develops and modifies the life and growth of a plant, gives character or want of character to its fruit and determines its durability. This being the case, it is perfectly natural and reasonable to suppose that a plant, animal, or that man himself would thrive best in that climate or country in which they originated. Climatic influence is that state of the atmosphere which makes the Baldwin apple in the coast towns of Maine less in size and somewhat wanting in color and flavor of the same apple raised in the interior or central portions of the State; it is that influence which makes the Baldwin in some portions of Piscataquis County a hard, sour cooking apple, in some parts of Washington County a medium-sized, insipid and greenish colored apple, in Kennebec, Franklin, Androscoggin, Cumberland and a few other counties a large-sized and beautifully colored fruit and nice to eat when you can obtain nothing better; it is that influence which makes the same apple raised in Massachusetts a little earlier and softer in texture, in Western New York a still larger and richer colored fruit and in central Illinois nothing but a fall apple. I am aware that I am treading on dangerous ground and that the facts will not always bear out the above statement, that the same results are frequently due to soil composition and soil conditions, but the general law holds good that climate marks a broader and a deeper influence on a variety than soil.

But I must come directly to the subject matter under discussion, viz:—the climatic line of fruit culture in Maine. Is this an absurd question? Has it been demonstrated beyond doubt that there are limits to fruit culture in Maine? If so, where? Can we draw a line anywhere in our State and say to fruit culture "thus far canst thou go and no farther?" If such a line can be drawn, who is bold enough to execute it, and where can he commence and where end? There is a prevailing opinion that the 45th degree of latitude is about the average northern limit to successful fruit culture in Maine, and this opinion is founded on our present knowledge of and our present development of the business. The facts will bear me out in saying that this line is the northern limit to successful fruit culture as at present developed, varied of course by the positions of the northern counties and the elevation of the land above the sea level.

The 45th degree of latitude runs through the lower portion of No. 4, Oxford County, just grazing the northern boundary of Lake Cupsuptic; in Franklin County through the northern portion of Rangeley, Dallas, centre of Plantation No. 1, and the northern portion of Mt. Abraham Township and Kingfield; in Somerset County through Lexington, Concord, Bingham, Brighton, Harmony and Ripley; in Penobscot County through Dexter, Garland, Charleston, Corinth, Hudson, Alton and Argyle, where it strikes the Penobscot River about fourteen and a half miles above Bangor; then crossing through Milford and Greenfield it strikes and passes through the upper unsettled portion of Hancock County, and thence on through unsettled portions of Washington County when it passes through Crawford, Cooper, Meddybemps, Charlotte, Pembroke, and winds up on the eastern border in Perry. Now a large part of Washington County is but a howling wilderness, the settled portions including those towns bordering on the Atlantic, Passamaquoddy Bay and the St. Croix River.

In Charlotte the Baldwin is grown to only a limited extent, while nearly every other variety known to pomologists is successfully grown with the exception of Williams' Favorite, King Sweeting, Primate, King and Porter, which are considered tender. Pears also succeed well, being tardy only in bearing. Some orchardists have tried the Baldwin to the extent of half a dozen trees or more and some pronounce it a good bearer while others call it a poor bearer. The experience of Mr. Henry A. Sprague has been that young trees bear but thinly, owing, as he thinks, to winter killing of the buds.

I wish to say in this connection, that fruit is successfully grown seventy-five miles north of Charlotte in Aroostook County at Houlton, ten miles north of 46 degrees latitude. Furthermore, that when Washington County becomes more settled and the farmers turn their attention more directly to agriculture and less to lumbering and fishing, there will be no climatic reason why fruit culture may not be a successful business in any portion thereof.

In Hancock County fruit culture is not pursued to any extent to which it is in counties west of the Penobscot. In favorable seasons they raise a small surplus for export but occasionally not enough for home consumption, when winter apples have to be brought from Boston. The climate, too, affects the fruit in the coast towns. On account of much damp and foggy weather the fruit in general is less highly colored and wanting in acidity or flavor. The same may be said also of the fruit in Knox and Lincoln. The Baldwin is the leading variety grown in Hancock County and there is no portion of her territory where fruit may not be successfully grown when proper attention is given to the subject.

Crossing over into Penobscot County, the northerly limit of fruit culture at present seems to be in the towns of Bradford, Charleston, Garland and Dexter, about eighteen to twenty miles north of Bangor. Fair specimens of the Baldwin and Greening are grown in these towns according to a statement made to me recently in a private letter by S. C. Harlow, one of the most intelligent and successful pomologists of Bangor. He calls these the northerly tier of towns in the county. In reality, they are below the middle of the county. He means simply that they are the northerly towns which are much populated or cultivated. If you go up into the centre of Patten, sixty miles farther north, you are then twenty miles below the northerly limit of the county, and if apples and other fruits can be successfully grown in Houlton, ten miles farther north than Patten, what is to prevent their being grown in Patten, or Stacyville, or in Mount Chase even? Nothing, of course, so far as climate or soil is concerned. The only drawback now is distance from railroad communication and the comparatively unsettled state of the country. Fifty years from now will make a great change and mark great progress in fruit culture.

I might go on with a similar statement of facts and a similar course of reasoning for Piscataquis, Somerset and Franklin counties, but it would take up too much time and not be specially profitable. I will say, however, that successful fruit culture has progressed farther north in Piscataquis than in any other county, with the exception of Aroostook. In Franklin County successful fruit culture has not progressed much farther north than Farmington, Temple and Weld. In New Vineyard, Strong, Freeman and Phillips the business is in that experimental condition where great uncertainty and great anxiety prevails in the introduction of those varieties which succeed well farther south, except in specially favored localities. In towns farther north, say in Salem, Kingfield and Madrid, fruit culture is in that condition it was in fifty years ago in Farmington. For this latter statement I am indebted to Mr. S. R. Leland, the well-known pomologist of Mt. Baldwin Farm, in Farmington.

You may not find as many climatic changes in Franklin as in Oxford, but you will find some quite as severe. When a man's entire yearly product of fruit, amounting to four or five hundred dollars, is destroyed in a night from one October freeze, or thousands of grafts from one to four years of age of several standard varieties are killed back to the parent stock in one winter, he is strongly inclined to mark his position as the climatic line of fruit culture. But it only goes to prove that he was unfortunate in the position of the orchard and in the selection of the varieties Select the proper varieties, engraft them on hardy, well-tested stock, plant the trees in soil suited to their growth, shelter them with evergreen or other forest trees, and I will venture to say that you have removed the climatic line in the course of fifty years—so far, at least, as your own position is concerned—one-half a degree farther north. We know that lightning seldom strikes twice in the same place and the records of the past will go to show that a freeze like that which utterly destroyed the fruit crop in Phillips and in adjacent towns five years ago, or like the freeze which within a few months past destroyed a large part of the orange crop in Florida and ruined many young trees, will not occur again for forty or fifty years. The orchardists in Florida are full of hope and courage, and the same persevering and indomitable spirit should pervade all our frontier or pioneer fruit culturists.

The climatic line of fruit culture in Maine is all moonshine. That staunch pioneer and venerable pomologist, Mr. Calvin Chamberlin of Foxcroft, has recently declared to me in a private letter that the subject will do very well to talk about, but that it will be a good deal like chasing the rainbow: it will be a great deal nearer to some than to others.

We all know that the thermal line of fruit culture varies greatly in one's own town. In riding the short distance of two miles, from my place to Hallowell, we cross a comparatively low valley where the thermometer on a cold winter's day or on a warm July night is always from five to ten degrees lower than what it is near the top of the hill, some sixty to seventy feet in elevation.

Now I cannot remember, but Dr. Hoskins of Newport, Vermont, will tell you just how many degrees difference there will be in the thermometer for every fifty or one hundred feet difference in elevation, and he will tell you just what the probable effect would be upon fruit culture for every ten or fifteen degrees of yearly average difference. It is not the sudden and short-lived dropping of the thermometer to thirty or forty degrees below zero that seriously affects fruit culture—we frequently have that in Kennebec County—but it is the shorter average season and the steady average of cold below zero. I am confident that, while I can make fruit culture successful in my present location, I could not do as well a mile away in the valley, not so much because of a difference in soil as the difference in temperature. And if such be the case here with me, what must it not be in many parts of Oxford and in Franklin counties? Now, if I was on the top of Mt. Abram, it would not take me long to decide whether a Baldwin or one of Dr. Hoskins' Iron-Clads would grow there. I should know they would not; neither would they grow and be productive down in the village of Salem, in the valley; but I would clear a nice little spot one-third of the way up on the eastern side, having the forest on the north and west as a protection, and there plant a Baldwin and expect it to grow; no, I will not joke, I should plant a small orchard of such varieties as had been tested for a like latitude.

How is it in Aroostook County? I learn from Mr. E W. Merritt of Houlton, who has canvassed the State pretty thoroughly, that, while detached positions in some of the more northerly towns of the county, such as Mars Hill, Mapleton, Castle Hill, Perham, and even as far north as New Sweden, are favorable to fruit culture of certain varieties for home use, it is impossible at present to make the business profitable. He considers fourteen miles above Houlton as about the northerly limit to fruit culture in Aroostook County. He says there are places in Houlton where it would be impossible to make a tree grow, and other places where all that you have to do is to set out your tree and it will grow and thrive if protected from cattle and mice. Furthermore, that the whole towns of Linneus and Hodgdon, with parts of Littleton and Monticello, are of this character and also large portions of the county west and south of Houlton. The leading varieties in Aroostook County are Tetofsky, Red Astrachan, New Brunswick, Duchess, Alexander, Fameuse, Wealthy, and Blue Pearmain, and these, after a thorough trial, are considered reliable and profitable. Other varieties raised and which have proved good and hardy, though not taking the lead yet, are Summer Harvey, Sops of Wine, Williams' Favorite, Canada Baldwin, Haas, McIntosh Red, Golden Pippin, Bloom, Alterton, Gideon and Magog. The Wealthy has proved, so far, hardy, productive, and a good keeper. But above all and beyond all, Mr. Merritt considers the New Brunswicker without a peer.

From this hasty glance over the State we find that fruit culture has its present limit at or near the 45th degree of latitude in Franklin and Somerset counties ; in Piscataquis, about twenty miles farther north ; in Penobscot, on or just below the line ; in Hancock County, twenty miles farther south ; in Washington, near the line, and in Aroostook as high up as 46 degrees 24 minutes. Fruit is actually raised in Aroostook, in a small way, 110 miles higher up than in Franklin ; in fact, if you should travel that distance north of Rangeley it would carry you out of the county and a long way into Canada. Now, what does this line, which varies so greatly, go to show? Certainly not the climatic line of fruit culture. It only marks the present progress of the business as determined by population, cultivation of the land and the interest manifested in this branch of agriculture. I wish to say, in closing, that no man in or out of the State has done more to advance the cause of fruit culture in our northern counties than Dr. Hoskins of Newport, Vermont. Aroostook County, in particular, is indebted to him for many valuable varieties, and these varieties could not be obtained and tested without patient investigation and long and careful experiments. Perhaps he, or some one equally as diligent, will yet discover the apple which for Aroostook and our other northern counties shall take the place of the Baldwin in Kennebec and other southern and central counties, and then we shall have no climatic line.

In the absence of the writer, Mr. Atkins' paper, which was next on the programme, was read by Hon. Rufus Prince.

THE MULCH QUESTION.

By Chas. G. Atkins.

Next to the fertilizing of the soil, there is no practice more generally approved or urged with greater emphasis by those assuming to advise about the formation of plantations of fruit trees than that of mulching. I do not remember ever to have heard a dissenting voice from this general verdict, that a newly planted tree or shrub should have a good coat of mulch spread about it. When, however, it comes to the continuance of the practice during the successive stages of the youth, manhood and old age of the orchard, we find no such accord. The most of our counsellors, some on one plea and some on another, advise us to discontinue the practice after a few years, and I doubt whether a single member of this society or of this assemblage will seriously advocate the mulching of a grown orchard on the same scale that is applied to newly planted trees, that is, so as to cover all the roots, which in a bearing orchard, even a comparatively young one, would amount to mulching the entire surface. That is something that once seemed to me unquestionably advisable, and I wish that I could now feel the same confidence, for it is much more satisfactory to write an essay when one feels that he has only solid ground under his feet, firm convictions to back up some positive advice, than when one sits astride the fence of indecision.

Like most points in farm or garden practice, there are many if's and and's to the mulch question, and to clear the way for a proper consideration of the most important, let us make a list of the advantages and disadvantages, allowed or alleged, of the practice.

Among the advantages of mulching I would enumerate the following: (1), protection of the surface soil from excessive drying; (2), the protection from sudden changes of temperature and therefore from alternate freezing and thawing in absence of snow in the cold season; (3), the prevention of the encrusting of the surface or of washing by rains, to which some tilled lands would be subject; (4), prevention of weeds; (5), securing to the roots undisturbed possession of the surface soil; (6), the promotion of nitrification and perhaps of other chemical changes in the constituents of the soil which render them more available for food for the trees; (7), the addition of fertilizing materials to the soil.

The objections may be marshalled thus: (1), to mulch a grown orchard thoroughly is expensive; (2), the mulch harbors insects and mice; (3), there is danger of fire sweeping through the orchard and destroying the trees; (4), the discontinuance of mulching after it has been long employed gives the trees a serious set back.

The limits which I have proposed to myself for this paper will not admit the consideration of all the specifications enumerated above, even were they matters of dispute. I will therefore ask attention to a few of the points involved.

The possession of the surface soil as a feeding ground seems to be a matter of great importance, when we consider the greatly superior fertility of that part of the soil. The first three inches may be termed the cream and the lower layers the milk, which is effectually skimmed when we allow any other vegetation to take possession of the cream, or by frequent cultivation prevent the roots of the trees forming in it. A mulch not only keeps down other vegetation but prevents the soil getting too dry to yield its manurial substances to the trees.

The fertilizing properties of a mulch have not, I think, generally received due attention. Any kind of vegetable matter contains fertilizing ingredients which are made available by their digestion by animals; but this is not an indispensable process, for if spread on the ground, exposed to moisture and the ordinary heat of the air, they will decay and then yield all their ingredients, in just as available form. A ton of clover hay fed to animals adds to the manure heap, if both solids and liquids are saved, about seven dollars' worth of nitrogen, phosphoric acid and potash. Spread on the ground it will yield twenty-five per cent more, or about nine dollars' worth, and there will be no such loss as occurs in most barns, where thirty or forty per cent of the value is lost by escape of the liquids. A ton of Timothy hay is worth some seven dollars in the same way. Straw is worth about three dollars. Now let it be remembered that these are the contributions of the several ingredients to the fertility of the soil in addition to whatever effect they may have by their direct action as a mulch, which, it seems to me, we may fairly estimate at not less than two or three dollars. This would make wheat straw worth five or six dollars per ton for our purpose, Timothy, nine or ten, and clover eleven or twelve dollars. Swale hay has a pretty high manurial value; indeed, the analyses just now accessible to me rank it so high that I dare not use them as a basis for computation. Doubtless some one will wonder what clover and Timothy have to do with the mulch question, and I make bold to reply that under some circumstances it might be advisable to use either of them as a mulch. It sometimes happens that they are spoiled by bad weather at haying time, and it would then be better to haul them direct to the orchard than to put them into the barn. Sometimes an orchardist has a surplus of hay and is tempted to sell. I made up my mind some time ago that no Timothy or other upland hay should ever leave my farm at a less price than nine dollars per ton, and I have had many tons of somewhat weedy but still salable hay hauled out from my barn and spread under the trees. As to clover, I must own having used it in prime condition as a mulch. I had a young orchard which needed enriching. By the aid of phosphate rock I got a handsome growth of clover. The first crop was mown and raked up near the trees a mulch; the second crop was allowed to go to seed. I propose to continue this practice till the clover runs out. I question whether there is on the whole any better way to feed an orchard than to rely wholly on mulch. Any kind of straw, grass or weeds will furnish all the needed ingredients, and have only to be applied in sufficient quantity to fully supply the demands of the trees and fruit. And this brings us plump against one of the objections to mulching.

First objection, its expensiveness. Now, to spread a little mulch around the trunk of each tree will not involve a great expenditure in a whole orchard, but to cover the entire surface would indeed cost quite a sum of money, or a great deal of work. But so does fertilizing by means of manure. A good farmer who had an opportunity to buy stable manure from any of our New England villages and wished to give a poor field a real good dressing would not think of putting on less than forty dollars' worth. Now forty dollars expended in mulching would probably put on six or seven tons, and that, I should think, would be a pretty good application for an acre, and I have no doubt that its effects would last longer than those of the manure. My friend, Mr. Weston of Belgrade, made this statement as the result of his experience: "If," said he, "you put a cart-body full of good barn-yard manure around an apple tree and two cart-bodies full of swale hay around another similar tree, the latter will show less effect the first season, an equal effect the second season and far greater effect from that time on."

Another objection which it seems should have some weight but not be conclusive, is that the result of discontinuing mulching after having employed it till the trees have attained considerable size is a serious check to their growth and fruitfulness. Evidently, however, this objection has nothing to do with the continued mulching of an orchard. It is only an objection to abandoning the practice.

There are yet to be considered two objections, which have, it seems to me, great weight, and which make me doubtful as to the advisability of mulching, after having satisfied myself that from every other point of view it is the best mode of treatment. These objections have reference to the harboring of vermin and the danger of fire.

I have never observed amongst my own trees anything that would lead me to think mice were more likely to gnaw mulched trees than those not mulched, but the testimony of others is quite strong. As to insects, I very much fear that mulch affords a better lodgement to the codling moth than they can find either in turf or tilled surface. A large proportion of these worms, on leaving the apple, drop to the ground and then start for the tree, an unerring instinct seeming to guide them toward its trunk, which they ascend a little way, in search of shelter, giving us an opportunity to trap and destroy them. If the ground is encumbered with any kind of impediment a large part of the worms appear to be prevented from reaching the tree, doubtless making their cocoons under shelter of the rubbish on the ground, where we cannot find and destroy them. The apple maggot is another insect which may profit from the presence of mulch, though too little is known of his habits and wants to warrant us in drawing positive conclusions.

Finally, the man whose earthly possessions consist largely of apple trees surrounded by such combustible material as dry mulch has good reason to wear an anxious face those breezy spring days between snow and grass, and cast many a nervous glance to windward on the watch for the column of smoke which is to be the precursor of the ruin of his hopes. Perhaps by and by we shall have a system of insurance against such losses, but for the present we who choose to mulch must shoulder a great risk. I have never known of any very serious losses from fire, but minor losses have occurred in my own neighborhood, which would have been great disasters had the entire ground been covered with mulch. Perhaps it would be well to leave the ground immediately about the trunk of a tree bare of mulch. When the trees are young this space could be hoed, and when they are older it could be allowed to go to grass, which would never be very stout under the spreading branches.

Thus, as I intimated in the beginning, though for a while I was able to blow a good horn in favor of mulching, yet has candor compelled me to come out of the little end at last and own myself just ready to crawl into my boots through fear of what may befall me as the result of what I have done and propose still to do to my apple trees.

The next paper presented was,

MISTAKES IN FRUIT GROWING.

By D. P. True.

After twenty years of mistakes and some partial successes, I think you will pardon me for the use of a few moments of your valuable time, and these few words of caution are not intended for you, as each of you know too well that "eternal vigilance" is the price of good fruit. We do not wish to discourage beginners, for we believe in the grand possibilities of the business, but in this short chapter I will point out some of the obstacles that beset the path of the fruit grower.

Many have made the mistake of setting cheap or poor trees, picked up in the woods or other places; trees covered with bark lice or stunted. All such trees are very unprofitable.

One of the most common mistakes made by some of the best orchardists is in having too many varieties, making more work in harvesting and not so desirable. In some cases a number of varieties have been placed in one tree. This is one of the worst mistakes. Different locations require different varieties to get the best results. Big mistakes in the selection of varieties have been made. One of the great questions with the orchardist is, What is the most profitable variety to grow and meet the wants of the present and future market? Mistakes are quite common in the distance of planting out trees. This question is largely one of circumstances. If one has more land than money it may be best not to set so near. Where land is more costly, trees may be set twice as thick as needed, and when the trees cover the land one-half of them may be removed.

One of the saddest of mistakes is where one puts trees in old worn-out grass fields and wholly neglects them and expects to raise an orchard. All such cases end in a miserable failure. Another mistake is in placing mulch so near the trunk of a tree and in such quantity that it will heat and kill the tree. The writer can testify to the loss of fifty valuable trees killed in this way.

Losses may occur from mice and the borer. Some have had whole orchards destroyed by one or both of these enemies. Careful pruning is necessary, but some have made bad mistakes in this direction; the leaves are to the tree what the lungs are to the body. Extreme cutting should be avoided.

In grafting, orchards in some cases have been nearly ruined by sawing too large limbs or hubs, setting poor scions, grafting limbs in the center of the tree, using poor wax, neglecting to look after the scions after the work has been performed. These have been the cause of much damage. Turning sheep and lambs into a young orchard without taking the precaution to coat the trunks of the trees with manure, has caused a big loss in some cases. Oxen and large cattle have proved very fatal to young trees, when turned into the orchard. Allowing trees to over-bear and break themselves down, is a mistake. Thin the fruit, but do not prop the limb.

If one has dwarf pears, as the quince root is fibrous, do not let the ground remain in grass; if you do you will make a mistake. Paying big prices for new varieties has in some cases proved a mistake. The writer has seen, in Washington County, large orchards, comprised mostly of Sulard crab. I think we shall have to call *that* a mistake. Tree agents sell us a bill of trees of a certain variety, and when they fruit they do not prove true to name. What shall we do, keep our temper and call it a mistake? But, in fruit growing, as in most other business, the profits are in proportion to the risks; and to all those that have a taste for the business we would say, grow fruit by all means. With the keeping qualities of our Maine fruit, and the large foreign demand, with our conveniences for shipping, the value of our fruit, compared with that from some other states in the Union, our cheap hill-sides so well adapted to fruit growing—when all these advantages are considered, what fairer prospect could we ask than to have good orchards on our farms?

The next paper presented was,

CAN THE CODLING MOTH BE TRAPPED?

By Samuel C. Harlow.

Under this head *The Home Farm* of January 7th published an article from the *Orange County Farmer* informing its readers that Mr. Smith, who had raised a large crop of fine winter apples, including Northern Spies, Greenings, and Kings—perfectly sound and free from worms—attributes his success to the placing in each tree a small tin cup with a solution of molasses, vinegar and water to attract the codling moth. As might be expected, the result, to use his own words, was, that he captured myriads of moths of various kinds, and he *thinks* a good many codling moths. But right here, when the success of this method seems so certain to the uninitiated reader that he resolves to use his own fruit in the same way, Mr. Smith dashes the hopes of his reader by the cool admission that he is not sufficiently versed in entomology to positively identify the codling moth; so that the question of whether among the myriads of moths, millers, beetles, bugs, and other insects (many of them injurious to orchards) there was a solitary specimen of the *Carpocapsa pomonella*, is one that will never be answered.

In replying, from my own experience, to the question that heads this article, my answer is: not in open-mouthed bottles or vessels of liquor, as I have found to my disgust. For several years I have experimented with sweetened water, vinegar, sour milk and other solutions, invariably without any good results, and my experience is sustained by some of our most experienced entomologists.

A friend of mine is confident that he destroys the codling moth as well as other insects, by bonfires through the orchard the last of June or in July. Yet it is an indisputable fact that this destructive insect is less attracted by light than other insects. It works by night and is rarely seen in its natural state in the day time.

My own opinion is that the codling moth cannot thus be destroyed. I will now refer briefly to a few methods of trapping the codling moth, each of which is successful to a limited extent only. The first, and that which is most satisfactory, because of its certainty, is to keep the doors and windows of the fruit house or cellar closed from the time the trees blossom through the month of July, or until all the larvæ have hatched and come from their cocoons, which may be found secreted in the crevices of barrels, boxes and baskets. In these dark recesses the insect changes to the perfect moth, and soon finds its way to the window in its attempt to reach the orchard. I have often taken advantage of this fact by destroying, with the aid of a broom, hundreds if not thousands yearly, as they fluttered on the inside of the window pane.

In localities where one is not troubled by his neighbor's insects many larvæ of this moth may be trapped and largely destroyed by tacking cloth bands around the trees just before the worm begins to leave the fruit. Cloth is considered much better than paper for this purpose. With strips of thick, warm cloth tacked around the trunk of the tree, I have in some cases caught not less than fifty at one examination of a tree. These examinations should be made weekly, and continued through August. Better results are obtained, if at the time of applying the cloth the trunk of the tree and larger limbs are scraped and the hiding places removed. After scraping the tree apply a strong soap wash to keep the bark smooth.

Many insects may be destroyed by picking off the wormy fruit as soon as it can be detected, before the insect leaves the fruit to enter the chrysalis state, and although but a part of the infected ones may contain a worm, it is small satisfaction to feel when you get one that you have not only destroyed the possible destroyer of a dozen fruits, but also prevented a manifold increase of these pests. All infested fruit, whether gathered from tree or ground, should be fed as soon as possible to stock, and thus prevent escape.

In regard to the advantage of sheep and swine in orchards to destroy the fallen fruit, it is evident that if the orchard is isolated it will be benefited in just the ratio of the fallen fruit destroyed, containing worms, to that portion from which the worms escaped before falling.

A trial of these several methods for years has satisfied me that however good any or all of them may be as aids, they are at best but partial remedies, that cannot be depended on for effectually destroying this worst enemy of the apple.

In an article on *this subject* two or three years ago, I reluctantly expressed the opinion that a resort to spraying with insecticides was the only effectual remedy. The general success attending this method during the last two years in the Western States, together with limited experiments made by myself, have convinced me beyond a doubt that spraying is the most successful remedy yet discovered. The general use of insecticides (poisonous or otherwise) for the destruction of the codling moth, as well as the canker worm, leaf roller, and various enemies of the apple, opens a wide field for investigation and experiment. I will briefly refer to a few of these.

Although there are many cases reported among western orchardists of the successful use of London purple, Paris green and white arsenic, there are very conflicting opinions as to the merits and demerits of each. For instance, London purple is recommended for its solubility in water, the purple color of the water showing plainly where used. On the other hand, it varies so much in strength that it is exceedingly difficult, as I have found, to determine the strength of the solution of a pound in a given quantity of water, or whether it will injure foliage or fruit, without first testing it on a branch. A test may require several days. Owing to the adulteration of Paris green with baryta, the strength of that also is uncertain; while its great specific gravity necessitates constant stirring, while spraying, in order to apply it evenly. In the use of arsenic (which to be pure must be white, not gray) great care is necessary in handling. To prepare it, take a pound of arsenic and boil rapidly for an hour in four gallons of water. This should be done in the open air. Care should be taken not to inhale the steam. When dissolved, reduce to about 200 gallons to make it safe for the foliage. Care should be taken not to give any part of the tree a double portion or throw the spray forcibly against the leaves, as I have myself scorched the leaves by neglecting both of these precautions. When spraying, always stand so as to throw the spray with the wind, beginning always on the lee side of the orchard, working backwards against the wind. In two experiments with a solution of London purple, at the rate of one pound to 200 gallons of water, owing to the uncertain strength of the purple and the force with which it struck the leaves (thrown by a fountain force pump), or from both causes combined, I found within a few days the foliage and fruit were both scorched to an extent that dwarfed them for the rest of the season. I would advise novices to test the strength of this and all other arsenical solutions, by spraying a single branch and noting its condition a week afterwards.

For the destruction of the first brood of worms it should be applied as soon as the apples are as large as currants. As to the number of applications, more light from actual experiment is needed. If a rain occurs soon after spraying, the operation should be repeated. Let me here say, in connection with the subject of rain, that all animals must be kept out of the orchard after spraying with either one of the above-named solutions, until heavy rains have washed the foliage and grass.

In what I have said above about spraying by any of the insecticides, reference is made to the first brood of worms only. If successful in destroying these and your neighbors do the same, there will be no *second* brood. Further experiments are needed, not only to determine which of the three above-named substances is best, but also, if possible, to find some insecticide that can be safely applied to the destruction of the second brood (where there is one) without injury to the fruit. Hoping to be able to attempt, if not accomplish this the coming season, I will close by reminding fruit raisers that after two large crops of apples in succession, we may expect a small one of fruit, accompanied by a large one of codling moths next season, and we should act accordingly.

Hon. Z. A. GILBERT then made a few remarks on the

MANAGEMENT OF FRUIT EXHIBITIONS.

The speaker referred to the practices employed in the exhibition of fruit in former times. In the last ten years a great advancement has been made, dating from the Centennial Exhibition. There must be plenty of room to arrange the exhibition of fruit in order for it to look well. If anything, you have been too modest in your demands for room. The entire upper hall of the exhibition building at Lewiston is none too large in which to properly arrange the fruit. In order to make this display as it should be, the plans should be definitely laid out in advance and a general system arranged. The leading exhibits should have the most prominent places and a sufficient amount of room should be reserved for the exhibition of the single plates of fruit. The exhibitors should have their fruit on hand promptly and the awards should be made by the judges before the crowds appear and before the fruit becomes second hand. We should have platters instead of plates on which to exhibit the fruit, as being more suitable to its proper display. The beauty of the floral exhibition is largely brought about by the careful arrangement of the many varieties. All samples of fruits and flowers shown should be perfect and representative of their kind.

The remainder of the afternoon was taken up with

DISCUSSION.

Mr. GILBERT. Mr. Brown, have you had any difficulty with blackberries winter killing?

Mr. BROWN. Yes, I have. The Wachusett Thornless has bothered me the most. But still I know where I can find them growing wild. The Snyder is a hardy plant. I know a man in my locality who planted an acre. He had done so in other counties and failed, but succeeded well here. I cannot recommend any one variety.

Mr. GILBERT. Is the Wachusett hardier than the Snyder?

Mr. BROWN. I don't know that it is. I think the hardiest if allowed to grow long canes will winter kill. In pruning, if my plants grow vigorous in June, I prune them; if they grow slow all summer I don't prune them at all. A man must use common sense in the matter of pruning.

Captain JORDAN. What time do you put out the plants?

Mr. BROWN. Just as soon as the frost is out of the ground a foot deep.

S. L. BOARDMAN. Does your market demand the blackberry?

Mr. BROWN. I sell ten times as many strawberries as blackberries. In order for a blackberry to sell well it must be a good one. I have little competition. Unless there is a clear field in market I would not recommend to plant only enough for home use.

Mr. L. F. ABBOTT. Do they rust?

Mr. BROWN. No, sir.

Mr. NELSON. Do you use anything to keep the canes from breaking in the winter?

Mr. BROWN. No, sir.

Mr. NELSON. How tall do they grow?

Mr. BROWN. The first year two feet; the second year I allow them to grow higher.

Mr. NELSON. How do you prune?

Mr. BROWN. I pinch the crown of the cane. To stop upper growth, snip with shears.

Mr. NELSON. Do you pay any attention to buds?

Mr. BROWN. No, sir.

Mr BRIGGS. You mention strawberry culture. Does it make any difference whether the plant is taken from near the original or farther out?

Mr. BROWN. Take it next to the parent stock. You can't prevent winter killing. You will lose more from the continual freezing and thawing than from any other cause. This action tears off the roots and leaves and finally throws the plants out of the ground.

Mr. BRIGGS. What do you do to keep them from getting soiled?

Mr. BROWN. That is a hard question.

Mr. BRIGGS. Did you ever use sawdust?

Mr. BROWN. No, sir.

Mr. JORDAN. Don't the raspberry throw up shoots?

Mr. BROWN. Yes, they all throw up shoots. I set rows five feet apart and set out five in a place. I like to have thick places near together. From these places I take out shoots to set.

Mr. NELSON. Are the cultivated raspberries troubled with the maggot?

Mr. BROWN. I have raised bushels and sold them to private customers who did not find a maggot in them. I don't deny but what they are there, but they are very few.

Mr. NELSON. How do you account for this?

Mr. BROWN. I suppose the maggots don't like them. Many do not like the cultivated berry. I sort mine in a bowl, put on some powdered sugar and put them in a cool place for twenty-four hours. They do not taste like the native berry.

Mr. ATHERTON. I want to say a word on the subject of our fall exhibition. I was much pleased with the remarks of Secretary Gilbert. I realize that there is need of more room, but we are pleading and not demanding and we should act as though we were at the courtesy of the Agricultural Society. The rule that the exhibits should be there at just such a time or be struck out is a hard one, and should not be enforced. We should reduce the number of our varieties. I believe we should have a separate exhibition.

Mr. BOARDMAN. We have, as a society, received the most courteous treatment from Judge Prince, who, with his one thousand and one other things to act upon, has been at a loss to see how to give us more room.

Mr. GILBERT. I don't agree with Brother Atherton in regard to a separate exhibition. The people want the two held together, and it will produce more effective results.

Mr. BOARDMAN. Very many persons here will remember the exhibition of the Society held in Portland in 1874. It was one of the finest the Society ever held, but there were but very few to attend it, and that is the reason we want the two exhibitions combined.

Mr. KNOWLTON. I want to revert to the question of the hardiness of the raspberry and blackberry. I agree with Mr. Brown in regard to pruning. It is quite as essential to cut out the suckers that come up from the bottom as from the top in both the raspberry and blackberry. I allow only three or four suckers to a plant. If you allow the Turner to have its own way it would set up a forest. I think this has a good deal to do with the hardiness.

EVENING SESSION.

BUSINESS MEETING OF THE SOCIETY.

A business meeting of the Society was held at 6.30 o'clock, preceding the public session, President Pope in the chair.

Z. A. Gilbert, L. H. Blossom and S. L. Boardman were appointed a committee to consult with the managers of the Maine State Agricultural Society in reference to enlarged accommodations for the proper display of the horticultural exhibit next autumn.

Mr. S. R. Sweetser, from the committee on the fruit exhibited, reported the following specimens contributed by the several parties mentioned: R. H. Gardiner, Gardiner, seven varieties; D. J. Briggs, South Turner, thirteen; Albion Ricker, Turner, six; John M. Jones, Turner Centre, six; D. H. Knowlton, Farmington, five; C. H. Moody, Turner, two; W. P. Atherton, Hallowell, seven; R. D. Leavitt, North Turner Bridge, five; L. H Blossom, Turner Centre, thirteen; N. W. Adams, Turner Centre, two; D. House, North Turner, six; G. W. Blossom, Turner Centre, fourteen; F. E. Nowell, Fairfield, nine; Rufus Prince, Turner Centre, eight; O. C. Nelson, Upper Gloucester, six; S. R. Sweetser, Cumberland Centre, five; A. E. Bradford, Turner Centre, one.

D. H. Knowlton, for the committee on the President's address, presented the following report:—

Your committee to whom was referred for further consideration the annual address of the President, having attended to the duty assigned them, beg leave to report:—

The suggestions made in the address are excellent and deserving of careful study by the fruit growers of the State. For the consideration of fruit growers in particular we call special attention to those portions of the address urging the importance of obtaining good nursery stock, of uniting together for the purpose of gaining more knowledge of fruit growing and securing better prices for fruit.

For further action of this Society we recommend,

1st. That a special committee on nomenclature be appointed by the President, to serve at the annual exhibition, whose duty it shall be to name, as far as possible, the varieties exhibited "for name," and to correct those wrongly named.

2d. That the Executive Committee take such measures as may be necessary "to enforce the rule, that no one shall be allowed in the hall at the close of the exhibition except those that have a pass with permission to remove goods."

3d. That this Society recommend the passage of a law by the State Legislature fixing the size of the apple barrel.

4th. That the President and Secretary of the Society take such measures as may seem proper to them to secure horticultural statistics, to confer with the Commissioner of Agriculture and other horticultural societies for the purpose, and to promulgate from time to time such information as will be of value to fruit growers of the State.

The report was accepted and the following action taken upon it: Under topic 1, Samuel Rolfe, W. P. Atherton, and D. P. True were appointed a committee on nomenclature; No. 2 was adopted; No. 3 was tabled; No. 4 was adopted, and referred to the Executive Committee for being carried out. The business meeting then adjourned and the public session opened.

PUBLIC SESSION.

The hour at which the public session for the evening was fixed having arrived, President Pope called the meeting to order and introduced the Secretary, Mr. Boardman, who read the following paper.

AN APPLE: HOW TO PICK IT, AND WHAT TO DO WITH IT.

By the Secretary, SAMUEL L. BOARDMAN.

Well has Downing called the apple, "The world-renowned fruit of temperate climates." Like wheat among the cereals, and the potato among vegetables, it stands with them at the head of its class and may most appropriately be denominated the "King of Fruits." No other fruit of the temperate zone has so wide a distribution, or attains excellence in so extensive a range of countries—being found as it is in nearly the whole of Europe, Northern Africa, Northern Asia, China, Japan, throughout the whole of North America, in South America (being abundant in Southern Chili) and in Australia. In fact, wheresoever civilization has planted its home—in all the temperate latitudes of the globe—there this king of fruits may be found not far from the cottage door, and its fragrant bins, in all their unctuous beauty, repose in the home cellar. In the United States apple orchards are cultivated from Florida to Alaska—even in so high a latitude as Sitka it blossoms in June but does not always perfect its fruit. The apple has been praised among writers and poets from the most remote periods of antiquity. In some countries the custom yet lingers of placing a rosy apple in the hand of the dead that they may find it when they enter paradise. Among the heathen gods of the northern mythology the giants eat apples to keep off old age. May it not be that with us moderns they had found out the health-giving properties of this glorious fruit, and endowed it with qualities which conduced to health and long life? Certain it is that the apple is full of vegetable acids and aromatics, which act as refrigerants and antiseptics—enemies to jaundice, indigestion and that dreaded member of the human system, a torpid liver. It is a gentle spur and tonic to the whole biliary system. Chemists also tell us that the apple contains a greater per cent of phosphorous than any other fruit or vegetable—which makes it a proper food for the scholar and sedentary man, feeding his brain and stimulating his liver. This was probably the view taken of the apple by that good old clergyman of whom John Burroughs tells us, who on pulling out his pocket-handkerchief in the midst of his sermon, pulled out with it two bouncing apples that went rolling across the pulpit floor and down the pulpit stairs. These apples were, no doubt, to be eaten after the sermon, on his way home—they would take the taste of it out of his mouth. Then, beside, it would be impossible for a minister to grow dull or tiresome with two big apples in his coat-tail pockets. He would naturally want to hasten along to "finally" and the apples—especially if the season were late fall and the apples Nodheads. Moreover, we must not forget that the apple is full of sugar and mucilage, which makes it highly nutritious. The English extol the apple in the highest terms. Mr. William Robinson, a great horticultural authority, of London, pronounces the American apple "the grandest fruit that ripens under the sun." And well he may, for the English apple is an insipid, tame affair, compared with the solid, aromatic, sun-colored and sun-steeped fruit of our northern orchards. In the humid, cloudy and foggy climate of England, the maple tree yields no sugar, and the apple tree no such sweet, delicious fruit as do our Tolmans and Franklins. "The grandest fruit that ripens under the sun." That may sound extravagant—but is it not true? What single fruit is adapted to so universal use, and to such universal taste? It compasses in its eatable, fresh condition, in all the markets of the temperate-zoned world, eleven months certainly of the yearly round, and in extreme instances the two ends of the year meet with apples still upon the table. Like bread, one never tires of the apple. Of what other fruit of the tropics or the temperate climate can it be said that everybody likes it at all times of the year? Pears, plums, grapes, oranges, figs, dates,—run through the entire list, and the apple will outlast them all. While the market is supplied with corky oranges, picked under-ripe, or with canned and preserved fruits from different climes, as insipid as they are costly, the northern-grown and northern-ripened apple, full to the bursting of the stored-up richness of the ripening autumn sun, takes its place on the fruit stands—a whole length ahead of them all, cheap in price, and appealing to the satisfaction of every taste.

Of all the English-speaking writers, I think John Burroughs has given to our apple its best "character." I have hunted in vain, through the whole body of our horticultural and poetic literature, for a better description of it than this charming author has given, but I fail to find it. If I were a good reader I would ask you to listen while I read you a few pages of his delightful word-painting of this most magnificent fruit. As it is, will you listen to a few sentences?

"The apple is the commonest and yet the most varied and beautiful of fruits. A dish of them is as becoming to the center-table in winter as was the vase of flowers in summer—a bouquet of Spitzenbergs and Greenings and Northern Spies. A rose when it blooms, the apple is a rose when it ripens. It pleases every sense to which it can be addressed—the touch, the smell, the sight, the taste; and when it falls, in the still October days, it pleases the ear. It is a call to the banquet, it is a signal that the feast is ready. * * * How pleasing to the touch. I love to stroke its polished rondure with my hand, to carry it in my pocket on my tramp over the winter hills, or through the early spring woods. You are company, you red-cheeked Spitz, or you salmon-fleshed Greening. I toy with you, press your face to mine, toss you in the air, roll you on the ground, see you shine out where you lie amid the moss and dry leaves and sticks. You are so alive! You glow like a ruddy flower. You look so animated, I almost expect to see you move! I postpone the eating of you, you are so beautiful! How compact! how exquisitely tinted! Stained by the sun, and varnished against the rains. * * * Noble, common fruit, best friend of man and most loved by him, following him like his dog or his cow, wherever he goes. His homestead is not planted till you are planted; your roots intertwine with his; thriving best where he thrives best, loving the limestone and the frost, the plow and the pruning-knife, you are indeed suggestive of hardy, cheerful industry and a healthy life in the open air. Temperate, chaste fruit! you mean neither luxury nor sloth, neither satiety nor indolence, neither enervating heats nor the Frigid Zones. Uncloying fruit, fruit whose best source is the open air, whose finest flavors only he whose taste is sharpened by brisk work or walking knows; winter fruit, when the tree of life burns brightest; fruit always a little hyperborean, leaning toward the cold, bracing, sub-acid, active fruit. I think you must come from the north, you are so frank and honest, so sturdy and appetizing. You are stocky and homely, like the northern races. Your quality is Saxon. Surely, the firy and impetuous south is not akin to thee. Not spices or olives, or the sumptuous liquid fruits—but the grass, the snow, the grains, the coolness, is akin to thee. I think if I could subsist on you, or the like of you, I should never have an intemperate or ignoble thought, never be feverish or despondent. So far as I could absorb or transmute your quality I should be cheerful, continent, equitable, sweet-blooded, long-lived, and should shed warmth and contentment around."

There, let us take breath; and while doing so I want to introduce you to the apple growing upon the trees we are to pick this evening. A grand sight, this orchard upon the hill-side with its branches borne down by the burden of sun-perfected fruit in the glowing days of early October. Every tree a bouquet, every apple, as it is, twin-brother to the rose. I have looked carefully through the list of the three thousand named varieties of this fruit to find the one single variety which we are to make the leading sort for our commercial orchards—the American Pomological Society's list of 322, and our own list of 85 varieties have each been diligently studied, and I have found my one noble apple that heads the list and occupies the highest place in the winter bin. It is an apple that adapts itself successfully to a wider range of climate, soil and location than any other sort; handsome in form and color, a deep, rich, magnificent red; solid and firm as a rock in flesh and texture; an apple that may be kept till August, and is in splendid condition all through the winter and spring, even into June; that stands transportation and shipment to foreign markets better than any other variety; that is more in demand as a commercial sort, and better adapted for Maine growers than any other that can be named—in one word, the Baldwin, a native of our old mother State, and the king of the New England orchard. Well, some may raise objections to my typical variety, and bring a lot of grave charges against it by reason of flavor, or other disqualification. It is not my purpose to argue with such; my purpose is to deny *in toto* their entire premises, and to insist that this is the one sole variety best adapted to commercial orchards in this, our splendid orchard State. To be sure, a man will want a few other kinds, a tree or two of some early fall apples; in all, not more than a dozen, possibly half a dozen would be better, of the late fall and winter sorts for the dinner-table and evening fire. This selection I leave every one to make for himself. What does a man grow trees and raise apples for?—that he may obtain cash from the business. It is this that he is after; and with no other variety can he get so much money, one year with another for a period of ten years, as from the Baldwin. The buyers tell us if the great apple handlers are to order a thousand barrels of apples, nine hundred and odd barrels will be Baldwins. The business of past years proves it; I can see no variety likely to take its place in the future that is to be. Therefore if you plant or graft for the coming years, plant and graft the Baldwin. It is the commercially-successful apple of the great north.

Our apples are now ready for the harvest—how shall they be gathered? Not as in the days of our boyhood, when two strong men went into the trees, and, shaking the branches as if they would tear the limbs from the trunk, sent the bullet-like apples rattling down upon the stubble, rubbish and rocks, and over the backs of us youngsters who ran under the trees for "fun," like shot from a modern Gattling gun—while another, with a long, crotched pole, gave the out-reaching limbs such fearful knocks, as though he were punching a refractory pig at arm's length. We have improved upon that. Then cider was the chief end of the orchard, and of some men, too, for I remember my old uncle had a cider tank built in his cellar, as large as a forty-hogshead cistern, which was fitted up with faucet, depth gauge, and other modern conveniences, and upon which he set his heart more than upon all the apples in his orchard, or the cattle in his stalls. Now the art of picking apples has come to be quite a study—in fact, almost a science; and I don't see why in the future a skilled apple picker should not be called "Professor" with quite as much propriety as a corn doctor or dancing master is now. Among the first requisites, there must be a good supply of ladders—not your lumbering, back-breaking ladders, with sides four by four, and rungs as large as a stick of stove wood, which it will take two men to elevate in position upon a tree, and will want a horse and pair of wheels to move about the orchard—but a strong, light, well-built ladder, wide at the base, to stand firm, and narrow at the top, in order to run in among the branches with no injury to the apples; a ladder which a man can take in one hand and walk off with, raising to the tree easily, built of smart wood, and painted. Don't have these ladders too long, but graduate them to the height of your trees. Step-ladders are also useful for the branches that cannot be reached conveniently from the ground. Next, you want a number of picking baskets—those which have the adjustable bail, like that of a water pail, are the best; because, in placing the basket of apples into the barrel the bail will tip back, allowing the basket to be inverted, when it can be removed, the bail or handle lying back over the side of the barrel out of the way. These baskets should all be lined with old carpeting or sacking, so that the fruit may be placed in them without fear of giving them a scratch or surface bruise, which is sure to discolor and injure it. Furnish each basket with a hook, by means of which it may be fastened to the rungs of the ladder or branches of the tree, leaving both hands free for business. Now we are ready to begin.

In the first place, pick from the lower branches all apples that may be reached from the ground. On some trees, trained low, this will be considerable. My wife, who is a better farmer than I am, has picked two barrels each, from many of my trees, standing on the ground, without uncomfortable reaching. Next, with the step ladder placed *under* the tree, gather all that can be reached from it among the inner branches. Now the ladders will come into use upon the outer limbs and extreme top of the tree, the stout branches making a good stage for the pickers' feet—I say *stout* branches, for remember that broken hips almost invariably lie concealed in small, weak ones. When the business of picking is in full blast one or two men should be constantly upon the ground to assist in receiving and emptying baskets from the pickers in the tree and thus save time, while a sufficiency of baskets, for exchange, should also be provided. Move about the tree carefully and steadily, or many apples will be knocked off and lost—as all apples that fall go into No. 2's or even ciders. In picking, follow out the branches from the trunk, picking clean on each one, and keeping finished work all the time. On the outmost branches pick the apples from the terminal end first, as the motion of the branch from picking is liable to shake off those from the extreme end. Moreover, where three apples are tucked on closely together pick the best one first—make this an invariable rule always, so that if by mischance one falls, it will be the smaller and inferior one. Never twist or jerk an apple from the limb, but, grasping it from the bottom, lift up on it gently and quickly. The apple loosens in an instant without having disturbed its near neighbors. Having gathered your tree, all the apples having been put into the same barrels to be sorted, then pick up those that are upon the ground by themselves, and, as Artemas Ward said, "move on." It is a trade, a science, as I have said, to pick a tree—the New Brunswickers call it "pulling" apples—and one that some men can never acquire. Boys make the best pickers, I think, where they will give heed to it. A bright city boy, whom I picked up last fall to pick apples for me, picked four barrels from one tree and did not drop or knock off but five apples while doing it. How many apples can a man pick in a day? I judge that ten barrels is a good day's work. But Mr. E. K. Whitney of Harrison told me that he took his boy home from Bates College to help him gather apples, last fall, and he picked forty barrels in one day, just to see what he could do. Bates is not an agricultural college, but I doubt if Orono could send out a boy who could do better.

If the apples are to be barrelled in the fall, the work of sorting and barrelling comes next. But whether they are barrelled or not will depend upon the early demand for them. We will assume they are to be put up as soon as picked, or within a few days, and will begin sorting up the pile which has been brought from the orchard, No. 1's and No. 2's together. We want No. 1 apples. Now, what constitutes a No. 1 apple, that is to say, a first-class marketable apple? This question will be decided, somewhat, by the conditions of the season, a large yield or otherwise, and by demand and supply. In some years that would pass for a No. 1 apple, which in other years would be at once discarded and put into the barrel of "seconds." A No. 1 apple must be of good size, fair, unbruised, have the stem attached, and be free from worm holes. Size is of course a comparative quality, but a first-class apple should not be a small one. An apple having a bruise or scratch upon it should never be included in a barrel of No. 1's; and all apples that fall in picking, however large or fair, must be rightly consigned to the "seconds." Falling cannot but bruise them even if the bruise does not at once appear; but soon the bruised spot becomes discolored, decays, and produces injury to a whole barrel. It is not necessary to have stems attached to all apples classed as "ones," but the facing apples should all have stems attached to them. Occasionally an apple with a worm hole in the blossom end may be admitted to a No. 1 classification, if otherwise large, fair and sound; but a worm hole in the side discards an apple from this class, however fair it may otherwise be. In barrelling have sweet, clean, good barrels—new ones if possible, if not, flour or cracker barrels thorougbly washed and cleaned, with all nails bent or broken off; this work having been done during the dull days of haying, and not just at the moment when used, for apples should never be put into barrels not perfectly dry. First, into the bottom of the barrel, which is to be the opening end, lay in a large sheet of white, unprinted paper, then face in a layer or two—some handlers want two layers faced—stems downward. Fill the barrel by emptying in the picking baskets full, one after another, giving each a steady but quite vigorous shake to settle them into position, until the barrel is full, having the last apples come a little above the chine. Head by means of the screw header, nail in the head securely, and with small twisted brads which will not go through the staves, see that the hoops are securely tacked down. Now, having grown and packed apples of which you will not be ashamed in any market in the world, put upon the head of each barrel a printed label bearing the name of the variety, and the name and place of residence of the grower, or name of the orchard, if you have a fancy or home-like name for your place or orchard. These are necessary requisites in obtaining a reputation for your fruit, and you want a reputation if you expect money and success from the business. So far, we have been talking only of choice No. 1 fruit. Your seconds must be reserved for domestic use or the local home markets. The windfalls must be fed or disposed of in some other way. I am so much opposed to cider manufacture, cider manufactures so many tipplers who graduate from the higher paths of liquor drinking, that I would bury all my windfalls rather than have them used for so diabolical a purpose. Still, good cider vinegar is infinitely better than the acidulated water sold so largely for vinegar, though the market for vinegar is not a large one, hereabouts, and is usually well supplied.

Now, having picked and barreled our apples, what shall we do with them? That is the "prize conundrum" for this year, I think, though possibly another fall may solve it to our satisfaction. But, with our cellars and bins full, a slight demand, and a price that barely pays the cost of growing, picking, barrelling and marketing, it really is a most serious question as to "what are we going to do about it." Of course we want to sell them, to get the highest price we can for them, and if we could have things just to our liking we would want an abundant yield in Maine, no apples in England, a slight crop in New York and Michigan, and a big price all winter for apples delivered in Portland. All these conditions don't come round just as we want them every year, but of one thing we may be quite sure—two years in succession where the opposite conditions present themselves are not likely to be followed by a third of like nature. So let us take courage. Two or three things may be mentioned as being *generally* correct—to be qualified somewhat, of course, by the particular characteristics of the season. These are, first, that *generally* the sooner you can get your apples marketed after they are barrelled and ready for market, and get the money for them down into your trousers pocket, or into that "old stocking leg" in the till of the chest, the better. There is shrinkage, waste, loss, expense, and risk in holding, re-packing, etc., and if you can sell in the fall at a good price, and avoid all this, be sure to do so. But observe, be wise! Don't send your apples to England, or anywhere else, on an over stocked market, because you want to get a reputation, as Secretary Gold did, and when all expenses are paid find you have not enough left to pay for picking and hauling to market. In one week last fall four American ports sent to England a total of 440,875 barrels of choice American apples, and kept it up for several weeks. Of course prices were low. Again, secondly, remember that *generally* we must plan to keep back our apples till spring. We grow the best late-keeping apples that ripen under the sun. I say we, and mean *we of the State of Maine.* But we have not the facilities for properly keeping them. House cellars, as a general thing, are not fit to keep apples in from November to April. They are too warm, are filled with vegetables and other necessary supplies, and are thoroughly unfitted to become the storage places for commercial apples. Cold storage cellars, or refrigerating houses, are coming to be an absolute necessity with our orchardists who are to make commercial apple growing a business. When in Nova Scotia, two summers ago, I visited the great apple storage house of Knill & Grant, built on the wharf of the Acadia Steamship Company—a building 100 by 150 feet, built of brick, and having a capacity for storing forty thousand barrels of apples. The foundation wall was of stone, the cellar bottom being six feet below high water mark, the walls of the elevation being one foot in thickness. The bottom was very moist, a flooring of loose boards resting on joist four inches above the earth. The temperature of this house was kept throughout the winter at thirty-five degrees. On June 5, 1884, apples were re-packed in that house which had been in there for six months, with a loss of only two barrels in one hundred, and the apples sold in Boston at $5.00 per barrel. Mr. Augur, State Pomologist of Connecticut, says there are several retarding or refrigerating houses in that State, used for the storage of apples, and he strongly recommends the co-operative plan for their further erection among the fruit growers of that State; say, forming a company for this purpose having a capital of $2,000, in forty shares of fifty dollars each. Then let this cold storage house be built near to some business shipping point, and yet within easy reach of a considerable number of orchardists, who can avail themselves of its advantages for storing their apples until the period arrives when they can sell them on the top of the market. Is such a plan quite beyond accomplishment by the orchardists of Turner, Winthrop, or Farmington, or any other apple-growing town in Maine? Nay, is such a plan not probable, and is it not likely to be a reality in the not far-off future?

There are other uses of the apple and methods for its preservation to which I have not alluded, but which become important features of the business of apple growing in certain seasons. In years when there is a scarcity of apples, many will be evaporated, made into jelly, or hermetically sealed—as is now being done quite largely by the Winslow Packing Company—but for present consideration I have thought these points less important than in a year when they would be of more immediate application. Moreover, I am aware some of the details I have given may have seemed tedious to experienced orchardists, though I hope to the novice they may have been of service. At any rate, I could not have omitted them and say what I wanted to say about the Baldwin, how to pick it and what to do with it.

The next paper on the programme was contributed by Mr. S R. Leland of Mt. Baldwin Farm, Farmington, read in his absence by Mr. Atherton.

THE FUTURE OUTLOOK FOR FRUIT RAISING IN MAINE.

By S. R. LELAND.

I shall not attempt to write a carefully worded essay on fruit raising, but instead write in a conversational and interrogatory style, as though I were conversing with a friend upon the subject. When I speak of fruit raising in Maine as a profitable business, a money-bringing crop, I mean principally the raising of apples. Pears, grapes and the small fruits cannot, in my judgment, be raised at a profit in Maine, except, perhaps, in the vicinity of our cities and large villages, but I would most surely recommend for every person who owns a piece of this earth, if no more than a village lot, to raise them in sufficient quantity (if he has the space to spare) for the use of his family, as a source of health, pleasure and enjoyment.

Is there any danger of an over-production of apples in Maine? The raising of certain classes of apples is already overdone. There is a large amount of inferior natural fruit raised in this State, mostly in the original orchards, which is worthless for any other purpose than for cider or feed for stock. Such fruit is of some value for the above-named purposes, but as the original orchards were almost invariably planted on the best tillage land on the farm, would it not be economy, where such orchards are too far advanced in decay to be grafted with any prospect of profit, to root them out and appropriate the land to other crops? Another class of apples raised in Maine far in excess of the demand is the summer and early fall varieties. That class of fruit matures at the season when the markets are overstocked with fruit of the same class. The tendency of such fruit to immediate decay after maturity makes it almost worthless to the orchardist in the interior of Maine except in sufficient quantities for family use. Now we come to the late-keeping varieties of apples such as have an established reputation in the markets. Is there any prospect of the production of that class of apples being overdone in Maine? The fine flavor and the late-keeping qualities of Maine apples have established for them an enviable reputation in all the markets of the world which they have ever reached.

Twenty-five or more years ago, when the tree agents began to flood Maine with the New York nursery stock, the cry was heard on every hand "that orcharding would be overdone, that apples would be raised in such abundance that they would be worthless." Many doubting Thomases have kept up the cry and will tell you to-day that they have no faith in future orcharding in Maine. How is it after twenty-five years have elapsed since that cry was first heard, that note of alarm first sounded? Has there been any over-production of good winter varieties of apples in Maine? Are there any more indications to-day of an over-production of winter fruit in our State than there were twenty-five years ago? It is true, years like the present will come, when the crop is large and prices low. Do not depressions come in all branches of farming and all kinds of business? Does it fall upon orcharding any oftener than upon other branches of farming? And even at the low price of apples this year, is not the net income of a well-kept orchard of winter fruit as great as that of any other crop we have produced?

The future outlook for the production of popular varieties of winter apples in our State is to me particularly encouraging. Now let us glance at a few reasons why we come to this conclusion. There is no doubt but the next decade will see a large increase in the number of apple trees planted in Maine, but many failures will also be made. Scores of men will take the fever for orcharding who are novices at the business. Some will plant on unsuitable land; some will plant more than they can or will take *good* care of; some, lured by the pretty pictures and glib tongues of the tree agents, will buy varieties not adapted to our climate, varieties not wanted in the markets; some will plant and neglect them, thinking when the tree is planted their duty is done; some will plant for cattle to browse and rub, so that thousands of trees purchased and planted will never live to produce a paying crop of fruit. The future increase in numbers of paying trees will be small in comparison to the number planted.

No doubt there will be an increased production of apples in the future, but need there be any fears of an over-production on that account? Will not the increase of consumers who are not producers keep pace with the increased production? Are not new foreign markets likely to open for our best varieties of shipping apples?

Can the future orchardist improve on the present one? It is an established fact, in this section of Maine at least, that our high, rocky hill-sides, where deep soil is always found, is our best orchard land, particularly for the Baldwin. Would it not be wisdom for future orchardists to plant their trees on such land and appropriate their good tillage land to other crops? Trees planted on steep and rocky land will need mulching with coarse manure and any vegetable matter for a few years, till their roots get well established among the boulders, after which they will flourish and bear excellent fruit without much care.

An orchard located on such land, perhaps, will not produce as bountifully as a cultivated orchard, but will not the owner realize as much or more net profit on the investment, taking into the account the low value of the land for agricultural purposes, as to plant his orchard on his best tillage? The future orchardist, to meet the demands of the markets and secure the highest price for his product, will have to sort and pack better than it has been the custom to do in the past. The markets are becoming more particular year by year on the sorting and packing of fruit.

The day is past when it will be wisdom for a man to send a barrel of apples to the markets with a few good ones on each end and the middle filled with refuse stuff, unless he is prepared to have them dumped into the dock.

The future outlook for the profitable production of the Baldwin and other varieties of popular winter apples in Maine is as good, in my judgment, as it has been at any other time within my remembrance. The man who plants an orchard in the future, selects a good soil and situation, propagates the right varieties, knows his business, studies his business and *attends to* his business, need have no fears that he will not receive a handsome reward for his labor and expense. A word in favor of the Baldwin as the leading apple to raise in this part of the State, and I will close.

The Baldwin tree, when planted on high land, where it belongs, has proved as hardy in Franklin County as any variety grown here, and has suffered as little from winter killing. It is a good bearer; the fruit hangs to the tree with great tenacity. It is attractive in appearance, an excellent cooking apple, a fair eating apple; will bear rough handling better than most varieties; stands up well to ship, and is one of the most popular apples in all the markets of the world where it has been introduced. A gentleman in Deering, who has been largely engaged in the apple trade for several years, told me recently that over three-fourths of the winter apples shipped to foreign countries were Baldwins, and a larger proportion than that of those consumed in the cities of this country were of the same variety.

In consideration of so many redeeming qualities as the Baldwin possesses, and its still increasing popularity in the markets, and in view of the comparatively small area where it can be grown in its greatest perfection, it seems improbable and almost impossible that it will ever be produced in excess of the demand. The man who has the proper location for a Baldwin orchard and has in his make-up a good share of that all-important element requisite to success in *any* business, "stick-to-it-ive-ness," need have no fears to invest in Baldwin trees to the extent of his ability to give them *good* care.

The concluding lecture of the evening was delivered by Mr. L. F. Abbott, agricultural editor of the *Lewiston Journal.*

THE FUTURE OF ORCHARDING IN MAINE.

By LYMAN F. ABBOTT,
Of the Lewiston Journal.

"The first duty of the farmers of our country is to provide our people with food and clothing," said an eminent agriculturist to an audience of Maine farmers not long since. To do this in the most economic line of labor, yet bearing results satisfactory in point of remuneration for capital and labor invested, is the paramount question with the Maine farmer to-day. Economic agriculture is a subject for thought, and through intelligent investigation has come to be the solid and magnificent foundation upon which the superstructure composed of all other economic industries directly rests, and indirectly every question which concerns the well being of society, as well. Intelligent agriculture lies at the foundation of our prosperity as a State.

There are various lines of work having an economic bearing upon the success of the cultivator of the soil. The relations of these to other or similar lines of economic agriculture within the borders of our own State, of New England, and measurably of the West, modifies to some extent success as measured by the usual standard of putting money into the pocket of the farmer. These relations have changed greatly within the last half century. Markets for all the products of the farm have changed. Methods of production, as well as the commodities produced, have undergone a wonderful change. This is true of our stock, our butter and cheese, our apples and small fruits. In the production of fruit let us briefly glance backward over the history of orcharding in Maine, the better to get our bearings as to the future of this industry in our State.

IN ITS NATURAL STATE.

The orchards of Maine which primarily covered the hill-sides on the farms of the pioneers of our State, and which now have nearly all passed off the stage of duty in producing their inferior fruit, were mainly composed of trees bearing natural fruit. An orchard engrafted to better sorts of apples was the exception and a long way from the rule.

But the change was gradually made of grafting these natural apple trees, which were more or less produced on the farms where set, by fostering the chance seedlings which came up from scattered seeds of apples brought to or produced upon the farm. This, in brief, was the beginning, and for many years was the practice ruling in Maine orchards.

After a while our farmers began to wake up to progressive ideas —better fruit and more of it—as population increased and made a demand for both. Progress has been gradual on the same line to the present time, till now, in view of the amount of apples produced and the low prices which have ruled for the past two years, the question is frequently asked: Will orcharding in Maine pay in the future, taking into consideration the greatly augmented interest shown in this industry within the last ten years all over our country?

This is the vital question which interests orchardists in Maine at the present time. In the first place let us consider the present status of Maine apples in relation to the markets.

PERISHABLE FALL FRUITS.

Our orchardists, as a whole, cannot count on a remunerative market for fall fruit; that is, as a specialty. It is true our cities and larger villages consume large quantities of the early and later fall varieties, and farmers living near enough to market so that transportation is not great, can find ready sales for a limited supply of such apples. But easy and rapid transportation renders competition from apple growers in Massachusetts, New York and localities farther south, a matter of easy accomplishment, which makes the marketing of perishable fall fruit an unsatisfactory business as a rule. The lesson here is obvious—curtail production in this direction.

Again, a study of the markets, domestic or foreign, speaking in the broader sense as American and European, shows us that the valuable sorts of apples called for to an extent to create anything like fancy prices, may be numbered upon the fingers—we might almost say—of one hand. But what are the facts regarding varieties in the orchards of Maine to-day?

They are producing from twenty-five to one hundred varieties of fruit, and the mania for varieties still goes on. If the production of such a vast number of varieties of apples has been profitable in the past, it certainly will not be in the future; then, grow fewer varieties and those of long keeping, productive sorts, generally of a red color and of good quality as possible.

GOOD CULTURE.

Another consideration which bears a prominent part in treating this subject is the cultivation of our orchards. In view of the competition and consequent depression of prices in dairy products, arising from the bogus butters with which the country is pretty effectually greased, a prominent agriculturist said the other day, while lecturing to Cumberland farmers, "It behooves the dairymen of this country to keep better cows and take better care of them and then by enhanced production be enabled to cheapen production, or in other words sell more butter produced at less cost, and though sold for a less price, realize as much or more money—because the relative cost will be less—and drive the greasy imitations out of existence." In point of production the same rule applies to orcharding.

I think most who have given thought to the subject will agree with me, that one important thing that Maine orchardists need to give more attention to, is better cultivation of their orchards. The quantity of larger and smoother fruit is greatly increased by judicious cultivation, while the quality in other ways is enhanced thereby. Less trees and better cultivation, whereby larger returns with less expense are obtained, must be the watchword of the orchardist of the future.

LESS TREES AND MORE CULTIVATION.

The rule has too long been in practice with farmers to buy and set apple trees to the neglect of those already planted. The time has fully come when farmers should turn their attention to better practice in caring for the trees they already have, rather than in multiplying their orchards. Said a good farmer and orchardist of Lewiston to us a short time ago, "Although apples are low there is more money in raising them at $1.50 a barrel than in raising any other crop." "And," continued he, "if I was a young man just starting out on a good farm and could be assured of $1.00 a barrel for all the good winter apples I could raise, I would go into orcharding as heavy as my circumstances would warrant, in preference to a general system of farming. I would make more money out of it." He recognized the fact that while the apple was on the increase, systematic cultivation and care in the selection of varieties and pruning and adaptation of varieties to markets, would bring good returns for many years to come, at least.

AN EDUCATED TASTE.

Another consideration we will mention, and one already touched upon in the last proposition, is the quality of the fruit produced. Our markets have become fastidious. This is so in relation to nearly every production of the farm. The class in our cities who are satisfied with the rubbish and second-quality articles in the markets is very small. The best is none too good, hence a good article is readily taken at prices ten to twenty per cent. above inferior articles, while the latter go begging for a market or perish on the dealer's hands.

Markets are fastidious as regards the eye. The looks of a thing goes a great way with a man when he buys articles for his mouth (with one or two exceptions). Handsome fruit and all of the same kind in a package will bring a good price in advance over equally as good fruit mixed several varieties together. We said to a groceryman on Main Street in Lewiston: "Can you sell a bushel or two of apples, sound and nice, but several varieties mixed together?" "Yes," said he, "we can get something for them, but they will sell for more to sort them over and sell each kind by itself. Somehow," he added, "customers don't like the looks of a mixed-up mess of anything, and they won't buy it readily."

MAINE FRUIT THE BEST.

And here it may be proper to remark that the Maine orchardist enjoys peculiar climatic conditions over most other portions of the country, enabling him to produce fruit superior, and hence appreciated in market above apples from most any other part of the world. This is true of all the fruit grown in Maine. Her strawberries command the respect of the Boston market-men to the degree of two or three cents more a quart than those shipped hither from any other quarter.

From the recent issue of a Boston paper we cut the following:

"The supply of apples is large, and though asking prices are not materially changed, yet $1.75 per barrel is about the top price for No. 1 Maine and New Hampshire Baldwins by the car-load. Very few Massachusetts Baldwins are worth over $1.50, while common grades rule much lower. Without an export trade it would seem that the production of apples in the country was about equal to the demand for the same. There always seems, however, to be a healthy demand for the choice lots of apples, whatever the year may bring forth with poorer qualities."

THE SUBSTANCE OF IT.

There is this about it, then, Maine apples are going to sell if apples from anywhere do, and at better figures; also, the choice lots will always be in healthy demand whatever the state of the market for poorer sorts.

We know a methodical orchardist who makes a speciality of the Nodhead apple. We said to him a short time since, "You'll probably make your orchard net you a couple of dollars a barrel for your Nodheads this winter?" "Oh, yes," said he, "I sold them right off for $2.60 a barrel." Comment is unnecessary.

To sum up, then, the orchardist in Maine who conforms his practice in line with the considerations we have named, has a future before him full of promise and hope.

IN THE LIGHT OF THE PRESENT.

In this connection let us consider the outlook for the fruit grower from the standpoint of orchard production and prices for the same the two past seasons. Maine has been blessed two years in succession with bountiful crops of apples. This has also been true of the apple-bearing sections of New England and New York. Foreign demand has been rather limited, and prices for fruit have ruled low. Orchardists, in view of this, have argued, we think, from false premises. They have seen in these two years' abundant crops and low prices, the dim foreboding of over-production and its direful consequences upon the apple interest of our State. And the evil, apparently, is enhanced every year by the continued enlargement of orchards and setting of more apple trees.

We have said such argue from false premises. Why? In the first place, who are the consumers of fruit, and what are the conditions upon which our markets are based? The apple, unlike some other commodities that enter into the domestic cuisine, is both a necessity and a luxury. Considered in that connection, the wealthy will always have it if it grows, but with the poorer class, which includes the great mass of laborers, the apple under certain conditions comes to them as a luxury which can be dispensed with in times when labor is in excess of demand, and luxuries have to be relinquished.

During the last two years great depression has ruled in business. Labor has been in excess of demand, with the consequent low price for the same. Economy has been the watchword in the millions of homes to the exclusion of luxuries in living, indulged in in prosperous times when labor is all employed at fair wages. It is not consumption of the products of New England farms by the thousands of the wealthy class, which gives active demand and remunerative prices for the products of Maine orchards, or anywhere else, but the millions of mouths of the families of wage-workers which determines the price of Maine apples at home or abroad. With the thousands of London's laborers parading her streets and howling with the despair of starvation, is not an augur for quick sales or remunerative prices for Maine apples shipped to English markets. With our laborers living from hand to mouth on scanty work and scantier wages, the luxury of a constant fruit diet gives place to the sterner necessities of bread and clothing.

WHAT OF THE NIGHT.

The times upon which we have fallen are anomalous. Financial depression lies upon the whole business world. America is not alone in the low state of her business interests. The same is true of the countries of the Old World. A reaction is coming when business will revive, and the Maine orchardist will be happy. He can grow the best apples in the world, and he knows it. That he will always find a market for them at remunerative prices, the horizon of the future glows with roseate hues of promise. While the wheels of our manufacturing interests are in motion, with their goods finding their way to the homes of millions of consumers, making a demand and a consequent call for labor to produce these goods, that commodity we call "money" will change hands and land a fair share in the Maine apple grower's pocket.

DISCUSSION.

After the reading of Mr. Abbott's paper a short time remained for discussion.

Mr. KNOWLTON, referring to the paper of Mr. Bennoch, read at the opening session, said: I think Mr. Bennoch meant the beetle instead of the borer; the mature insect instead of the larvæ. In warm, sunny days these perfect insects will come out. I speak of this, thinking that a misapprehension might go abroad in regard to the matter.

Mr. S. R. SWEETSER. I find a good ladder a very desirable thing to have in the orchard. I use one with a hook on the top end, and that ladder will stick in any tree that you can't reach from the ground.

Mr. H. L. LELAND. I do not know that I can add anything to the remarks already made. There is one thing, however, I would like to say, and that is, that our State is especially adapted to fruit growing while some other localities are not so favorably situated. We must have a standard apple. Many have tried to get one to take the place of the Baldwin, but they haven't succeeded as yet. I would suggest that the meetings of the Society, instead of being held in the centre of the State, be held in other sections, that the knowledge may be better disseminated. I would like to speak on small fruits, because I think they teach a useful lesson to every farmer in the State. And with a little attention every family could be supplied with fruit. Are the majority of them so supplied? I fear not. The larger number are dependent on nature for their small fruits. I would like to hear from Mrs. Knowlton, who can tell us about flowers. It is just as much a part of farm life to have flowers as to have fruit. With the cultivation of more flowers, our lives would become more refined.

Mrs. D. H. KNOWLTON. I might say a word on the arrangement of flowers for the table, as nothing so much contributes to the true appearance of a dinner table as a vase of flowers. One pretty idea is a hanging basket filled with flowers, suspended over the table. We have one at home suspended from the place where the lamp hangs in winter, the table lamp in summer not being needed. I have seen a simple design of a saucer filled with small, choice flowers, placed on a corner bracket, that was very pretty.

Mr. Boardman. I will just say a word about flowers in the guest chamber. Nothing is more pretty or appropriate than to place a vase or saucer of flowers in the chamber where your guest, when you have one, is to pass the night. It is an evidence of thoughtful appreciation, of welcome and good cheer, quite as positive and as lasting in its effects, (showing your gladness at seeing your friends), as much as it is to set a good dinner before them. They speak a welcome quite as hearty as the words, "I am glad to see you." Arrange a little bouquet for your guest chamber, and see if it don't bear good results.

Mr. Solon Chase. You are in one of the best apple towns in the State, and if you come here next summer you will find these hills covered with trees full of ripe and delicious fruit. In our own district we have a 1500-barrel orchard which represents the growth of thirty years. When I was a boy we raised apples and we began to eat them in the blow and ate them all the rest of the time. There is nothing so good for an apple as to eat it. We can't raise apples enough for our own people. There is no better apple in the world than the Baldwin, but you have to raise them in the proper localities. With me the Northern Spy is a better apple than the Baldwin.

Mr. Nelson. I can talk a great deal better in my orchard than I can here. I have been somewhat engaged in growing Nodheads. There is only one trouble, it has no foreign market. The time is not far distant when there will be an over-production of fruit. In Boston there is more demand for the Ben Davis than for any other variety. One thought in regard to the naming of fruit. I remember some apples that I took to Brunswick which I thought were Pippins, and when the committee reported, they called them Gloria Mundi. Soon after a man came up and looked at them a moment and exclaimed, "Those ain't Gloria Mundi, they are Pippins." Now how shall I enter that apple at the next State fair—as a Gloria Mundi, a Pippin, or as a Gloria Mundi Pippin?

Mr. Atherton. There is one question in fruit raising which I would like to have discussed. What shall we do with our cider apples? I had three hundred bushels this year and could not sell them at enough to pay the cost of picking and carting. My only alternative was to feed them out or to make them into cider. I decided to have them ground up. Now, what is the feeding value of cider apples for our stock. I do not know, as I have never tried them, but would like for some one to tell me. Of course there is a moral side to the question of cider making which we must take into account.

After the passage of the usual complimentary votes of thanks, the meeting closed with singing by the Turner Grange choir.

This closed one of the most successful meetings the Society has ever held. The town of Turner, though somewhat far from rail communication to accommodate those who wished to attend from other sections of the State, is yet one of the best orchard towns in Maine, and its citizens were anxious that the meeting should be held in their midst. The citizens of the place were very kind and hospitable to all visitors; and the members of Turner Grange not only gave the free use of their hall for the meeting, but the lady members of the Grange also provided two abundant and finely served dinners, of which all visitors and those in attendance were invited to partake. This gave zest and good feeling to the occasion, and added much to the pleasure of the meeting. Although but little opportunity was had for discussion, yet this loss was compensated for in the number and valuable character of the papers presented. It is to be hoped that future meetings may be equally as profitable.

MISCELLANEOUS PAPERS.

FRUIT GROWING IN THE DIFFERENT COUNTIES IN MAINE.

Before writing his essay on the "Climatic Line of Fruit Culture in Maine." which appears in this report, the author, Mr. Atherton, addressed letters of inquiry to prominent fruit growers in different parts of the State, asking questions in regard to the varieties grown and the success attending their culture. The answers received contained much information which could not all be embodied in his essay, and Mr. Atherton has placed these letters in my hands, believing that they contain matters of experience and history regarding fruit culture in our State, sufficient to warrant their preservation in the transactions of our Society. I have, accordingly, carefully edited these letters, and present below what seems to me to be their most important contents. Their writers, as will be seen, are gentlemen of known prominence in connection with the pomological interests of our State, and this gives greater value to these county reports on fruit growing.

AROOSTOOK COUNTY.

There are portions of this county that are well adapted to orcharding, and other parts where apples cannot be profitably grown. I do not extend my sales above 14 miles north of here, for this is the very northern limit of orcharding except in some isolated spots where there happens to be an admixture of granite, potash, etc. Some of these detached positions are found in Mars Hill, Mapleton, Castle Hill, Perham, and even as far north as New Sweden, where apples may be raised in limited quantities for family use, but cannot possibly be made profitable.

There are places in this vicinity where it is almost impossible to make an apple tree grow, then there are other localities where all that is required is to set out the tree and it will thrive if protected from cattle and mice; nearly the whole town of Linneus and Hodgdon, with parts of Houlton, Littleton and Monticello, are of this kind, with large portions of the county west and south of here.

There are a considerable number of natural orchards in Linneus. Hon. P. P. Burleigh has a large one which he is grafting into the choicest hardy sorts and some that are not very hardy, as an experiment. I wish all of his townsmen were as enterprising: it would add greatly to the wealth of the town.

As to varieties, I do not think the Baldwin can possibly be made to grow here. I canvass as far as 75 miles south of here and there is not a Baldwin tree as far north as that, to my knowledge, and there have been many set out. There is in the town of Springfield, 67 miles south of me, a tree that has some Baldwin scions on it that were sent from the Kennebec, which have borne some, but for some cause they do not ripen and turn red, but look green and are insipid. This is probably owing to our cool summers and few hot days. It is out of its proper latitude; in other words, if you could raise a Baldwin apple tree here you could not raise a Baldwin apple upon it.

We can get along very well without the Baldwin, as we have other apples equally as good and perfectly hardy. The Wealthy has been thoroughly tested here and found to be perfectly hardy, very thrifty and productive, and, I think, better flavor than the Baldwin; will keep as long when raised here, but is not as solid in flesh. It is a handsomer apple than the Baldwin and I do not see why it will not sell as well.

I now and then see a Northern Spy here, but the fruit buds are tender and winter kill so no fruit appears on the tree, in fact scarcely a blossom.

The Rhode Island Greening, Bellflower, Bethel, Gravenstein, Rambo, Twenty Ounce, Spitzenburgh, King of Tompkins County, Peck's Pleasant, Walbridge, Pewaukee, and many others that do well on the Kennebec will not stand our winters.

Our leading varieties are the Tetofsky, Red Astrachan, New Brunswick, Duchess, Alexander, Fameuse, Wealthy, Blue Pearmain, which after a thorough trial have proved reliable and profitable. The following are not the leading yet are good hardy varieties: Summer Harvey, Sops of Wine, Williams' Favorite, Canada Baldwin, Haas, McIntosh Red and Golden Pippin; also, Bloom, Alterton, Gideon and Magog (which are new varieties) have done well so far.

The Wealthy has done well here on nearly all kinds of soil and treatment; we have not a hardier or more thrifty tree on our list; the Gideon does not thrive on a deep or sandy soil. Fameuse is hardy, is a garden tree, needs to be cultivated and well dressed in order to produce fair, nice fruit; but after all these varieties have been admired and commended and placed in their proper leading place in the list, then, standing out ahead and alone without a peer, is the New Brunswick, bearing a very heavy crop every year, making the whitest and best flavored dried apple, easily cooked, with flesh as white as flour.

E. W. MERRITT.

Houlton.

FRANKLIN COUNTY.

There is no material difference in the climate of the settled part of Franklin County and that of Cumberland and Kennebec. We have more snow here and it lies on later in the spring, but the frost is usually out of the ground when the snow is off and vegetation immediately starts. Apple trees in this vicinity blossom a full week earlier than on some soils nearer the coast—say on Walnut Hill, where I have particularly noticed it. Some late-growing varieties, as the Spy, attain their growth a little earlier near the coast, as in the more southern portion of the State, than here, I have noticed. All varieties that will mature in any part of Maine will mature in Franklin, as far as climatic influences are concerned.

The Baldwin grows in great perfection in this part of the county if put upon high land, and it succeeds well in Kingfield, Phillips, and fairly well in Madrid. In the Dead River Valley and the Lake regions apple raising is in much the same condition it was here fifty years ago, nearly all natural fruit which produces fairly well, but I doubt if any but the most hardy varieties could be grafted into those regions with much prospect of success.

If you wish to set definite bounds of the northern limit of culture, I should say a line drawn somewhat south of Mts. Abraham, Bigelow and Saddleback. The leading apple in this county is the Baldwin. The leading varieties are Baldwin, Northern Spy, Rhode Island Greening, Fameuse and Talman Sweet, for winter apples, and almost all the kinds you ever heard of for summer and fall use —but it is not profitable to raise the latter here, except what are required for family use.

I will say the Roxbury Russet does not succeed well with me, and it is the general complaint; but I think owing more to the soil than the climate. I esteem high, granite land the best orchard land in this county, particularly for the Baldwin, and the thicker the boulders upon it, the better the tree will thrive. The next best is the schistose soil. You will remember that is the kind upon which my orchard stands. I have given my Roxbury Russets the best of care, but my Baldwins out-bear them ten to one, and I am satisfied that my soil is no place for them and shall graft a part of them to Baldwins next spring. Franklin County apples have the reputation in the markets of being of fine flavor, well colored and late keepers, and most of our winter varieties attain a large size.

S. R. LELAND.

Mt. Baldwin Farm, Farmington.

HANCOCK COUNTY.

Fruit culture is not pursued in Hancock County on such a scale as in Kennebec or any part west of the Penobscot River. Occasionally the crop of apples is insufficient for home consumption, and winter varieties are brought from Boston, but generally there is a small surplus for export. Orchardists do not appear to have studied the market much, and the list of varieties raised, though a long one, consists largely of varieties little known abroad.

I think there are more Baldwins raised in this vicinity than any other sort; though just across the river to the westward Bare-Limbed Greening takes the lead. The Baldwin is not, however, so well suited to the climate as to that of Kennebec, and does not attain such perfection. The tree appears in general hardy enough.

In the old orchards you will find the Yellow Bellflower, Kilham Hill, Nodhead, Blue Pearmain, Mathew Stripe (or Martha Stripe), a very sour winter apple; an old-fashioned russet, something like Roxbury, Hunt Russet, Stone Sweet (a hard winter sort), Queen's Pocket (winter), Lyscom (September; also known as Mathew, or Martha Stripe), Hightop Sweet, Williams' Favorite, Golden Russet (early), Leland's Golden Pippin, Bell's Early, and a long list of obscure sorts, mostly unnamed.

In the younger orchards are Wagner, Northern Spy, King, Golden Russet of Western New York, Red Astrachan, Duchess, Gravenstein, Fameuse, Ben Davis, etc. First four appear to give satisfaction; also, Fameuse and Gravenstein. King is praised by growers;

Wagner also. Ben Davis is condemned. My own observation warrants a high place for Hunt Russet and Golden Russet; both exceedingly productive, and of good flavor, and good keepers. Black Oxford is praised, but not much raised. I speak only for Bucksport and other towns adjoining, on the river about its mouth. In the interior of the county they might tell a different story.

We have a great deal of foggy weather here, being just at the head of Penobscot Bay; and often cool and damp here when dry and warm in Kennebec. I think the weather affects the quality of the fruit. Flavors are not so sharp as with you. Hunt Russet on my farm in Manchester is more acid than I like to eat; here, just right. Northern Spy is insipid compared with those grown in Manchester. Bellflower and most others not so good. Colors also less bright here, generally. As to form, I have observed no difference.

CHAS. G. ATKINS.

Bucksport.

KENNEBEC COUNTY.

The trees in my Greening orchard came from New York. The distance apart is 24 by 24 feet, but they ought to have been 30 feet, as the branches nearly touch now. I am quite sure it was seventeen years last spring that they were set. The land, previous to setting the trees, had been in pasture a great many years, and several inches of the surface soil was made land from the wash of the road above, which added very much to the fertility of the land. For several years after setting the trees I cultivated the land, planting with potatoes and beans. It was then seeded to grass. I have mowed the grass each year and put it around the trees; in addition to this I have used a good amount of swale grass with which to mulch the trees; but the last few years I have manured it in alternate years, spreading it evenly over the whole surface.

A large part of the land where my old orchard was set was made land, washed from the Seminary hill above (in some places ten inches deep), and I find it has the staying qualities in it. On all of my orchards the land was stony and rather moist, but not wet.

From the experience I have had in orcharding, I am fully convinced if we wish to raise large crops of fair fruit we must keep up the fertility of our orchards, so that the trees will make a good growth and bear a good crop of apples at the same time.

J. W. SMILEY.

Vassalboro'.

LINCOLN COUNTY.

Apples, pears, plums and grapes can be successfully grown in every town in Lincoln County. The Baldwin is the leading apple grown. The leading varieties of apples are Red Astrachan, Early Harvest, Bell's Early, Duchess of Oldenburgh, Fameuse, Gravenstein, Porter, Orange Sweet, Winthrop Greening, Jewett's Fine Red, Somerset, Hurlburt, Talman Sweet, Granite Beauty, Foundling, Baldwin, Rhode Island Greening, Yellow Bellflower, Northern Spy, Golden Russet, Hunt Russet, English Russet, Fall Pippin, King of Tompkins, Wagener, Ben Davis and many others.

The apples and other fruit grown in the seaboard towns are much smaller in size, and more backward in season, than fruit grown in the interior of the State, therefore would not command as good a price in Boston market; yet fruit can be successfully and profitably raised in this county. The soil is well adapted to fruit raising, and the climate does not injure our trees, as the tenderest varieties are perfectly hardy. I propagated more than one hundred varieties of apples, and I have not lost a tree, after it had started one year, for ten years. Some ten years ago I lost half a dozen nice trees one winter; since that time I have not had a tree winter killed. The orchards that are situated on high land inclining east or south have done the best. The cold, damp winds and fogs from the ocean, during the summer months, is the reason our fruit does not attain the size of the fruit grown in Kennebec and Androscoggin counties; but we can enrich our orchards with sea manures, such as rockweed, seaweed, mussels, kelp, etc., at a less expense than can the farmers of the inland towns, and trees mulched with sea dressing are not troubled with borers. For the past three years there have not been but two borers discovered in my orchard.

H. J. A. SIMMONS.

Waldoboro'.

OXFORD COUNTY.

I think the leading apple for Oxford County is the Baldwin. The leading varieties would be named in this order: Baldwin and Rhode Island Greening for winter; and Snow, Gravenstein and Hubbardston Nonsuch for fall. Fruit can be successfully grown as far north as Bethel and Andover, and finally, in fact, almost anywhere in Oxford County. Other fruits, like pears, plums and grapes, are grown, but I think pears are not a success with us. Climate has no ill effect on fruit growing here. Our soils in this county are mostly gravelly loam and what would be called rough, rocky, uneven land. It is natural fruit land; still we need fertilization, and have got to have it in order to get the best results from the orchard. We have here, as everywhere else in Maine, too many varieties, and many orchardists are now grafting over into Baldwins.

C. H. GEORGE.

Hebron.

I have over seventy different kinds of apples, but the McLellan stands at the head, as far as beauty and profit are concerned. The trees are very hardy, good growers, form a very handsome top, bear abundant crops of smooth, sizeable, handsome apples, free from black blotches and other defects that damage the apple crop. I have an orchard set nine years ago last fall, in which there are forty-five McLellans. Last fall I gathered from those trees seventy barrels of nice apples. The orchard was set on new ground, which is a rocky side hill, cants to the southeast, and has been pastured with sheep ever since they were set. I do not know their origin, but had the scions of Thomas Wright of Strong, eighteen or twenty years ago, for Nodheads. I have had them on exhibition at the fairs for several years. They always attract considerable attention, and I have never seen them exhibited by any one else.

The Baldwin is the leading apple here and succeeds well on high land, but often fails on low or river land. The common varieties of apples can be grown successfully as far north as the towns of Weld, Temple, Phillips, but fail to do well farther north, though some of the iron-clad varieties have been grown with fair success at Rangeley, which is about forty miles farther north. We succeed in growing pears, plums, cherries, grapes, and the various kinds of small fruits, though they do not do as well here as they do farther south. I think climate affects our fruit crop more than the soil, though the climate is as uneven as our section of country is; the temperature varies from ten to twenty degrees within a few miles. Orchards do best that are well elevated, much better than on low land.

J. J. TOWLE.

South Carthage.

PENOBSCOT COUNTY.

Here in Bangor, although the grafting of thrifty young trees at the ground with Baldwins or Roxbury Russets often results in winter killing the first winter, yet grafting in the limbs proves a perfect success, and I shall re-graft many of my early apples to Baldwins and Northern Spies.

As to the northerly limit of the Baldwins, fair specimens of that and the Greening are raised in the northerly tier of towns in this county—twenty miles north of this city—viz: Bradford, Charleston, Garland and Dexter. Crossing the county line to Sangerville and Dover, Baldwins are still found in limited numbers, and extend to Foxcroft, the residence of our venerable and successful pomologist, Calvin Chamberlain, Esq., who speaks of the Baldwin in his locality as being more suitable for cooking than eating, which statement can be fully appreciated by comparing one of these with one raised in the southerly part of the State.

As to the other standard varieties, I cannot think of any in the Society list, but are raised in towns north of Bangor—the Hubbardston Nonesuch even being raised by Mr. Chamberlain for a leading variety. Several orchardists agree with me in the order named: Baldwin, Rhode Island Greening, Yellow Bellflower, Duchess, Red Astrachan and Talman Sweet; also many Northern Spies, Porters, Pearmains, Gravensteins and King Sweets.

The other fruits beside apples are standard pears of the best varieties, the number increasing yearly; plums and cherries, the latter largely reduced by black knot. Many young plums are set annually, also strawberries, raspberries, blackberries, grapes and currants. The old bushes of the last named have been largely destroyed by the currant worm and neglect of cultivation.

In answering the question, "Does climate or soil affect our fruit most?" I will say that although fruit in our county is no exception to the general law of combined influences produced by both climate and soil, and notwithstanding our variety of soils, comprising gravelly, sandy, loamy and clayey, the soils are generally adapted to our varieties of fruits; and my opinion is that the effects of climate predominate over those of soil in its influence on fruit in our county. As to what determines varieties, climate or soil, the superior quality of the Roxbury Russet grown in the vicinity of Monmouth, where the soil abounds in iron, and the superiority of a Yellow Bellflower, Northern Spy or Nodhead raised in deep, rich soil, as compared with those varieties raised on a thin, poor one, are familiar illustrations of the influence of soil on varieties. The fine flavor of a Baldwin or Spitzenburgh grown in Western New York, as compared with that of the same varieties grown in their northern limit in Maine, as also the change of early or fall apples into winter, and *vice versa*, as shown in different latitudes, afford proof of the still stronger influence of climate, so that in view of the above facts, I conclude that varieties are influenced by both climate and soil.

SAMUEL C. HARLOW.

Bangor.

PISCATAQUIS COUNTY.

The Rolfe apple is a fall apple and will not keep and hold its flavor later than January. It is a superior apple and leads all other varieties in its season in Piscataquis County. Tree hardy and a good bearer. The northern limit of successful apple culture in Piscataquis is the boundary of the "forest primeval." A tract extending along the line of the Piscataquis River eight or ten miles in width includes nearly all the cleared land, and these hill lands are good orchard lands. The number of varieties are almost unlimited. The most valuable varieties include Astrachan, Hightop Sweet and Duchess for early use. For fall—St. Lawrence, Rolfe, Winthrop Greening. Early w'nter—Fameuse, Nodhead. Winter—Hurlburt, Hubbardston Nonsuch. Late winter and spring—Rhode Island Greening, English (Poughkeepsie) Russet, Talman Sweet, Black Oxford. The Baldwin is grown but is not reliable; tree not quite hardy, and fruit does not fully mature.

There is not much done in growing pears or plums, partly through indifference and more largely from the fact that plums and cherries are injured by the black knot. Grapes are grown but are uncertain to mature.

H. L. LELAND.

East Sangerville.

You ask of the possibilities of fruit culture in Piscataquis County. When we consider, as we must, that Maine is a State of "magnificent distances," and that Piscataquis, although not the largest of her counties, is three times as large as the State of Rhode Island, one-third larger than Delaware, and two-thirds as large as Connecticut; that it lies wholly north of latitude forty-five degrees, and stretches away its sixteen townships in length by seven in breadth, to the northward more than a degree and a half, we must realize that it is pretty well up in the "cold north," although the territorial centre of the State falls within the township of Bowerbank in this county, and Lake Sebec occupies its almost exact geographical centre. But as only an average of the first four southmost ranges of townships are settled, that territory is usually understood to be "the county" when treating of this subject. We are north of all the settlements of Oxford and Franklin, and of the larger part of those of Somerset.

I regard the northern limit of the surely successful cultivation of the Baldwin apple to be the very high range of hills running easterly and westerly through the towns of Charleston, Garland and Dexter, and being very nearly the southern boundary of this county. Baldwin apples are, however, grown on high ridges by grafting in the limbs in this county. I own an old orchard on a high ridge back of this village, that contains some old trees grafted to Baldwins and other kinds, I believe, by that veteran orchardist, Calvin Chamberlain, Esq., probably between thirty and forty years ago. They are, of course, now going to decay, as are the others; but still yield the Baldwin for family use. Some of these we have kept until the Fourth of July.

The ordinary varieties of apples (except the very tenderest) are successfully grown in the settled portions of the county, and I know no reason why Dr. Hoskins' list for the north could not be grown anywhere in the northern portion.

H. A. Robinson.

Foxcroft.

All of Piscataquis County lies north of forty-five degrees parallel of latitude, with possibly a part of the town of Wellington excepted. Prof. M. C. Fernald, with some students, made an observation at this village some years ago, but I do not remember the odd minutes as they found; but if you wish for exactness, probably Prof. F. can give it. If you should be looking for altitude as bearing upon fruits I can give you, as shown in the survey of the R. R. crossing my place, the most of my orchard and garden as very nearly four hundred feet above the tide at Bangor. I am forty rods from Piscataquis River and about fifty feet above it. Departing from the river on either hand, many of the best apple orchards are found from two to four miles away, and two to four hundred feet of altitude above.

Several of your questions may be found answered directly or otherwise in what I may say from observation concerning the Baldwin apple. I know of no apple so changed and so variable through conditions apparent or not, as this. This fact has all the way been so observable that many people now believe that there are several distinct Baldwins—a family of them—and are spoken as the red or the yellow. It is grown in small quantity here but can hardly be called successfully. More than thirty years ago a friend in Medford, Mass., knowing my then zeal in obtaining good fruit, sent me a barrel of Baldwin apples to show that he had a tree producing the best fruit known under that name. I went to that tree for the purpose of taking scions, and found it standing on the outer edge of an embankment of the old Middlesex canal—then abandoned and the water withdrawn. I saw that its superior location could fully account for its reputation. The drainage was perfect. The old surface soil long covered by the mixed earth of the embankment, all together within easy reach and bearing very little of other vegetation, presented plant food in excess of demand. I took scions and set them in my nursery. Near that time, Mr. S. L. Goodale made his first visit to my place and there made the remark, in his forcible manner, that I had the best soil for a nursery he had ever seen. Now for results. My nursery had the best of care, but not a Baldwin ever came to condition to be placed in the orchard.

Large numbers of well-grown Baldwin trees were brought here from Massachusetts and other States many years ago and they very rarely lived to produce fruit. Some trees in the older orchards upon the hills have had their tops changed to Baldwins—I have done some of it myself—and some of these still live, but yield a fruit that would be passed as inferior at Hallowell. I consider this variety to be estopped by climatic influences alone, at or a little below the 45 degrees of latitude. Climate undoubtedly here affects fruit much more than soil. Unfavorable soil may be considered as confined to the narrow limits of stiff clay.

You ask for our leading varieties. I cannot answer. We have people here who are able to exhibit thirty or forty varieties from a not very large orchard. I could do it myself. The late tendency is towards the introduction of the claimed "iron-clads" or extra hardy trees. This course is adding several new varieties, to which I have given little attention. I am often in the way of seeing our apples as they circulate in the home market through the village groceries, where the old varieties are not crowded out. The Hubbardston Nonsuch, Jewett's Red (Nodhead), Blue Pearmain, Black Oxford, the Greenings, English Russet, Red Canada, Yellow Bellflower, Northern Spy, &c. In late fall and early winter, the Rolfe is seen on the increase. I have lately seen some good Tompkins County King. The Fameuse is on the increase and deservedly so, as they continue with me in fine condition to the present writing.

The every-day inquiry is for a good winter apple for market. We have so many kinds, and consequently produce so few of any one, that it is not easy to gather in a single, uniform carload for a distant market. This state of things does not promise to be soon improved.

I think it is generally conceded that an apple grown near its northern thermal limit is at its best in quality as well as its keeping habit; but this thermal line or boundary to a fruit is not usually found in narrow, well defined limits, and has no respect for lines of latitude. It is a good thing to talk about, but, like the rainbow, distant neighbors don't see one and the same thing.

For summer apples Red Astrachan and Duchess are most grown. Duchess trees have been set in too great numbers, producing as it does with certainty such enormous crops. The last crop in and near this village could not all be sold and used. If picked before ready to fall and put in the cellar, its season for use can be extended two months or more. The Red Astrachan appears to be a general favorite over a large portion of our country. I spent the months of July and August, 1884, between the valley of the upper Mississippi and Massachusetts and passed over much of the intervening country at the season of early apples, and saw very few beside the Astrachan.

In answer to your question, "What other fruits do you raise?" I can say that pears succeed as well as apples, and an increasing interest is seen in their production. One variety — the good old Flemish Beauty—does better here than with you. Our last crop was abundant and very fair. We were once well stocked with plums and cherries; then a change came and the trees went out with the black knot. Some recent attempts, rather timidly made, towards a restoration go to prove the presence of the same old scourge. Most of the small fruits succeed as well here as anywhere in the State, with perhaps the single exception of grapes. The success of this desirable fruit, more than with others, is weakened with each mile added to its removed distance from its sunny habitat.

With some fair crops many years ago we were encouraged to continue the trial of new varieties, till my list exceeded thirty; and my neighbor, Dr Robinson, has gone to a much higher figure,—being a younger man with a younger enthusiasm. Though but half a mile distant, his location proves less favorable, he having repeatedly been hit by spring and autumn frosts from which my place has been exempt. From his *experiment station* he can beat me when we report failures.

CALVIN CHAMBERLAIN.

Foxcroft.

WASHINGTON COUNTY.

The Baldwin is grown here to only a very limited extent. Some orchardists do not grow it at all; others have from one to six trees. Some say that it is a good bearer, but my experience is that young trees, at least, are very thin bearers, probably by reason of the buds being winter killed. There is no leading apple in the sense that the Baldwin is the leading apple in your section. There is more, probably, of the Allen (which I think probably is a synonym of Golden Pippin) grown here than of any other one variety. Also, for early apples, a good many Red Astrachan, Duchess of Oldenburgh or New Brunswicker, and some Alexander. As leading varieties, I might add Harvey Sweet (probably this is what is described in the books as Sweet Harvey), Yellow Bellflower, Fameuse and Ben Davis. Such kinds as Hubbardston Nonsuch, Colvert, Wealthy, Scott's Winter, Magog Redstreak, Talman Sweet, Northern Spy, Oxford Russet and many other kinds flourish here; but such as Williams' Favorite, King Sweeting, Primate, King of Tompkins County, Porter, etc., are rather tender.

Several varieties of pears appear to be hardy here, but all or nearly all are tardy bearers. There are, as you must be aware, varieties of fruit which require particular soils, and others which require a mild climate; so I can give no general answer to this question. I think climate affects the quality of fruit more than it does the form or color. I have seen favorable seasons when the Ben Davis was a good apple, but it is usually poor, though good looking. Several varieties of apples are better on dry soils than on wet.

The questions I would ask are in regard to sweet apples. King Sweeting is with me good enough in quality, for a very short time, but bears only every other year, and is rather tender. Early Sweet Bough is good, but not a heavy bearer. St. Johnsbury Sweet not quite as good and a poor keeper. Garden Royal might pass for a sweet apple, but is not a constant bearer. Talman is fairly productive and a good keeper, but requires to be baked before it has a good flavor. Have not yet myself tried the Harvey Sweet, but intend to do so and hope to find that one a good sort. Do you know of any earlier and later sorts which are of good quality to eat raw and good bearers? I would be glad to have some one answer these questions.

I came near forgetting to answer one of your questions. You ask me how far north of here our leading apples grow. Sixteen years ago I grafted some trees seen along the road to Presque Isle. I have not been there since, nor have I heard from many of them. I have, however, learned that they have fruited at Presque Isle and have kept till June, but are too tender to be of much account. I saw some very nice ones at Calais, said to have come from Houlton —too ripe to keep longer than an early winter apple, which is about what they have, averaging in keeping qualities till about March.

HENRY A. SPRAGUE.

Charlotte.

YORK COUNTY.

My knowledge is confined to a few of the northern towns of this county; but, as these are all well adapted to fruit culture, what I may say may perhaps apply to the county as a whole. In answer to your first question: "What is the leading apple grown in your county?" I would say the Baldwin is a long way ahead, and is gaining in popularity, on account of its excellent qualities as a shipping apple. Shippers prefer it to any other. It is also as productive as any and more so than many kinds. Other profitable and leading varieties are Sweet Bough, Red Astrachan, Williams, Porter, Nodhead, Pound Sweet, Hubbardston Nonsuch, Rhode Island Greening and Roxbury Russet. Many other kinds are raised and have more or less of merit, as Cole's Quince, Golden Sweet, Gravenstein, Mother, Benoni, Foundling, Talman Sweet, Duchess of Oldenburgh, Snow, King and Golden Russet. Many new varieties are being palmed off on the farmers by tree agents, they claiming great things for them which are not realized when they come to bear. There is no limit, on account of cold, to fruit culture in this county. Unsuitable soil, in certain sections, is the only hindrance that I know of. A good many apple trees are being set every year and the quantity of apples shipped from this section is rapidly increasing. Query—Shall we overdo the business?

Some ten years ago or more, many pear trees were set which grew so thriftily that hopes were entertained that they might be made profitable and consequently large orchards of them were set in the town of Newfield. These trees flourished well for a while and began to bear some, when the blight began to appear, which has blasted the hopes which were raised. Grapes are grown to quite an extent at Newfield. Plums are being planted considerably and of late years have not been affected with black knot so much as formerly. Most of the small fruits do well, but are not grown to any great extent.

F. B. GUPTILL.

Cornish.

THE McLELLAN APPLE.

By DR. T. H. HOSKINS.

The McLellan apple was highly recommended to us, some eighteen years ago, by Dr. E. C. Worcester of Thetford, Vt. The tree is a good grower and pretty hardy, yet not sufficiently so for our exposed locality. Wherever the Westfield Seek-no-Further will succeed, the McLellan may be planted. The origin of this variety was in Woodstock, Conn. The tree is a fine, upright grower, and makes an excellent and healthy orchard tree. The young shoots are of a dull, reddish-brown color, and slightly downy. The fruit is medium, or above, in size, roundish, very regular and fair, color yellow, with a good deal of red in stripes and splashes. Stalk short, in a deep cavity. Basin shallow, with a small, partly-closed calyx. Flesh white, tender, vinous, juicy, very good to best. The McLellan can be grown considerably north of the Baldwin line, and is an excellent keeper. As it is a heavy annual bearer, it needs good land and liberal manuring, but it pays well for it.

A CHOICE OF APPLES.

By Charles Downing.

Apples are the most valuable of fruits, and the varieties named below are all good for family use. A tree or two of each kind, well cared for, will give a supply from July to June, and a month or two longer with a little extra pains:

1 Early Harvest,	12 Rhode Island Greening,
2 Red Astrachan,	13 Melon,
3 Fanny,	14 Sutton Beauty,
4 Primate,	15 Baldwin,
5 Jersey Sweet,	16 Grimes' Golden Pippin,
6 Porter,	17 Jonathan,
7 Peach-Pond Sweet,	18 Northern Spy,
8 Fall Pippin,	19 Newton Pippin,
9 Mother,	20 Lady's Sweet,
10 Hubbardston Nonsuch,	21 Red Russet.
11 Bleheim Pippin,	

For those who raise especially for market, varieties should be selected that succeed best in the locality, which may be ascertained by inquiry of those who make orcharding a business and know the kinds most in demand in the markets they supply. Experienced growers for market say that a few sorts rather than many give the most profit. For small gardens a few varieties grown as dwarfs on the paradise stock will supply a moderate family during the summer aud autumn, for culinary uses and eating; Nos. 1, 3, 6, 7, 8 and 9 are good varieties for this purpose. Winter apples can generally be purchased more readily than sumer and fall kinds.

PLANTING APPLE TREES IN THE COLD NORTH.

From a lengthy paper read before the Ontario Fruit Growers' Association, by A. A. Wright, of Renfrew, the following paragraphs are taken, as bringing out a peculiarity of planting. The reader will readily see what kind of soil he has to deal with:

Doubtless it may be considered useless to tell any one that it is unwise to plant even a single tree, much less a large number, until the ground has been thoroughly drained and properly prepared for their reception.

A few words as to the best method of preparing the soil might not be out of place here, nor unacceptable to the beginner. So far as my own experience goes I have found the best results by first plowing the land up into ridges, so that the center of the ridge shall occupy the place where the trees are to stand. Then plough the land again in a cross direction, thus dividing it into squares, in such a manner that the center of each square will mark the place for planting the tree. A series of high knolls will thus be formed so that if the work be well done the land will be quite effectively surface-drained at least.

It is by no means objectionable to proceed in this way on any kind of soil; but it is absolutely necessary that it should be effectually done on anything approaching to a heavy clay.

Your knolls having been thus formed sufficiently high, preparations should be made to prevent the roots of the tree from going too deep into the ground, otherwise when the heaving of the ground, which the frost invariably causes, takes place, the descending roots will be torn asunder, whilst those which find a place near the surface and spread themselves out sideways from the tree will largely escape injury.

To prevent this downward tendency of the roots, the Jesuits and the original French settlers on the island of Montreal invariably placed a large flat limestone under each tree, and this was found to accomplish the desired object as the roots could not, of course, penetrate the stone, and on reaching it would turn outwards and grow in a lateral direction from the tree.

But these large masses of stone are not always available in every locality, and even when they are, they are cumbersome and heavy to handle.

The following has, however, been found an excellent and effectual substitute: Take the trunk of a pine tree, say about two and a half or three feet in diameter, and from this saw off blocks from three to four inches in thickness, placing them so that there will be one about eighteen inches deep under each tree when planted.

These are easily procured, readily handled, and appear to answer the purpose for which they are made, quite as well as the stone; the pine wood when placed under the gound and away from the action of the air enduring a long time, and is quite effectual in giving the desired direction to the roots of the trees.

THE FRUIT CATALOGUE.

It has been ten years since the Fruit Catalogue of the Society has appeared in the annual report, the last revision having been made at the Winter Meeting of the Society held in February, 1886. The original list was modeled with much care, and its preparation involved a good deal of work. But however correct and good a guide a list of fruit might have been for 1876, the same becomes somewhat obsolete for 1886, as relates to the small fruits, especially the whole list of berries. The Executive Committee of the Society felt that it was time to have the list again appear in our Transactions. Even if it was published in the form of its last revision, it would serve to bring it to the attention of our members and lead to its ultimate perfection. As there was no opportunity to revise the list at the time of the meeting at Turner, the Executive Committee decided to allow the Secretary to send proofs of the Catalogue to the members of the Fruit Committee and leading growers in the several counties, for corrections, such corrections to be embodied in the list. This has been done and the few changes that appear are the result of this action of the Committee. In general there have been few changes in the list of apples, the chief revisions occuring in those divisions relating to the small fruits. Under this action the Secretary, and not the Society, is responsible for the changes. The list will be found to be somewhat modernized by this course, while its authority, in the main, has not been lessened. Its publication now, after an interval of ten years, will at least direct attention to whatever errors it may contain, and to have these errors pointed out and corrected is one object in publishing the Catalogue. Corrections to it are invited from all fruit growers in the State.

Catalogue of Fruits for the State of Maine.

Plan of the Catalogue.

The names of varieties are given according to the nomenclature adopted by the Society, which is substantially that of "Downing's Fruits and Fruit Trees of America." A few leading synonyms are given, and these are placed in italics immediately under the name adopted by the Society.

The State is divided into three divisions, designated as the Northern, Central and Southern divisions.

The Northern Division embraces Northern Oxford, Franklin, Northern Somerset, Piscataquis, Penobscot and Aroostook counties.

The Central Division embraces Southern Oxford, Southern Somset, with Androscoggin, Kennebec, Waldo, Hancock and Washington counties.

The Southern Division embraces Cumberland, Sagadahoc, Lincoln, Knox and York counties.

The explanation of the abbreviations and signs used in the several tabular columns is prefixed to the list of varieties in each of the respective classes of fruits.

Cultivators are requested to note carefully any errors which may be found in the catalogue, or any well-founded opinions derived from their observation and experience differing from the conclusions therein indicated, in order to report the same at future meetings of the Society, with the view to make the catalogue as nearly perfect as possible.

I—APPLES.

Explanation of Abbreviations and Signs.

In the column of "Size" l. stands for large; m. for medium, and s. for small. In the column of "Quality" b. signifies best; v. g., very good; g , good, and p., poor. In the column of "Use" C. stands for cooking; F., family use—cooking, baking, etc ; D., dessert, and M., market. In the column of "Season" S. signifies summer; E. A., early autumn; A., autumn; L. A., late autumn; E W., early winter; W., winter, and Sp., spring. In the columns devoted to the several divisions, h r signifies highly recommended; r., recommended; †, not recommended; ?, introduced but not fully and extensively tested; blank, nothing reliable known of the variety in the division under which such blank is found.

It should be borne in mind that any recommendation is for the special use designated in the column of "Use."

CATALOGUE

Number.	NAMES.	Size.	Quality.	Use.	Season.	Northern Division.
1	Alexander	l.	p.	C.	A.	h. r.
2	American Summer Pearmain	m.	b.	D.	E. W.	....
3	American Golden Russet *Golden Russet.*	s.	b.	D.	E. W.	....
4	American Golden Pippin	m.	v. g.	....	W.	....
5	Baldwin	m.	g.	M.	W.	†
6	Beauty of Kent	l.	p.	M.	W.	....
7	Benoni	s.	v. g.	D.	E. A.	r.
8	Black Oxford	s.	g.	....	L. W.	r.
9	Blue Pearmain	l.	g.	M.	W.	....
10	Brigg's Auburn	l.	v. g.	D.	A.	....
11	Canada Reinette	l.	v. g.	M.	W.	h. r.
12	Cole's Quince	l.	b.	D.	E. A.	h. r.
13	Congress	l.	g.	M.	A.	....
14	Danvers Winter Sweet	m.	g.	F.	L. W.	....
15	Dean *Nine Ounce.*	m.	b.	D. C.	A.	h. r.
16	Duchess of Oldenburg	l.	p.	C.	A.	h. r.
17	Early Harvest	m.	v. g.	D. C.	S.	†
18	Early Strawberry	s.	v. g.	D.	S.	....
19	Early Pennock	m.	b.	D.	A.	....
20	English Sweet *Ramsdell's Red Sweet.*	m.	v. g.	M.	E. W.	r.
21	Esopus Spitzenburg	m.	v. g.	M.	W.	†
22	English Russet	m.	g.	M.	W.	r.
23	English Russet *Poughkeepsie Russet.*	s.	v. g.	M.	Sp.	....
24	Fameuse	s.	b.	D. M.	E. W.	h. r.
25	Fall Harvey *Harvey.*	l.	g.	M.	L. A.	r.
26	Fall Pippin	l.	v. g.	M.	E. W.	r.

OF APPLES.

Number.	Central Division.	Southern Division.	REMARKS.
1	†	†	Hardy, productive, and showy. Succeeds well in high latitudes.
2	....	....	Not extensively grown. Limited trial proves well. In Kennebec reported a good bearer.
3	r.	r.	Excellent dessert apple. Prolific. Several varieties are erroneously grown under this name.
4	....	?	An old variety. Never extensively tried in this State.
5	h. r.	h. r.	Hardy—Should be planted on well-drained land.
6	?	?	
7	r.	r.	Highly recommended by many.
8	†	†	Hardy and productive—inclined to overbear. Not good for cooking, hence not popular in market.
9	r	r.	Reported by some to succeed well in Northern Division.
10	r.	....	A native of Androscoggin County. Popular whenever tried.
11	....	....	Hardy. Succeeds well where tried in Aroostook County.
12	r.	r.	Two varieties are grown in Maine under this name.
13	r.		
14	†	†	A late keeping sweet apple—not very popular. Has been generally superseded by other varieties.
15	r.	?	A popular apple wherever known. Productive.
16	r.	?	Hardy in Northern Division. For extreme north cannot be too highly commended. Claimed by some to be a distinct variety—a seedling of Duchess of Oldenburg.
17	r.	r.	Under good cultivation one of the most desirable early apples. Quite tart unless fully ripe.
18	r.	r.	
19	h. r.	....	One of the most popular in market where known, as a dessert apple. Good bearer.
20	?	....	Popular in some sections. Not extensively tested in Maine.—Recommended by those who have tried it.
21	†	†	Excellent, but not productive enough to be recommended. Extensively tried, yet not popular when profit is the test.
22	r.	r.	This is not the English Russet of the books. Good grower—productive. Quality hardly "good."
23	r.	r.	A valuable late keeper. Not so large as Roxbury Russet, but succeeds on soils where that fails.
24	r.	r.	Very hardy. When well grown, one of the best selling apples raised.
25	r.	r.	Supposed to be identical with Harvey. A fine fruit. Succeeds well in Northern Oxford and in Franklin.
26	....	?	

CATALOGUE OF

Number.	NAMES.	Size.	Quality.	Use.	Season.	Northern Division.
27	Fall Jenneting	l.	v. g.	M.	A.	h. r.
28	Foundling	m.	g.	D.	A.	....
29	Franklin Sweet	l.	b.	F.	A.	....
30	Garden Royal	s.	b.	D.	A.	....
31	Gloria Mundi	l.	v. g.	D. M.	A.	....
32	Golden Ball	l.	g.	C. M.	E. W.	†
33	Gravenstein	m. to l.	b.	D. M.	A.	h. r.
34	Granite Beauty	l.	v. g.	M.	W.	....
35	Hightop Sweet	s.	v. g.	F.	A.	r.
36	Hoyt Sweet	m.	b.	F.	W.	....
37	Hubbardston Nonsuch	m.	b.	F. M.	E. W.	h. r.
38	Hurlbut	m.	v. g.	M.	W.	....
39	Jewett's Fine Red *Nodhead.*	s.	b.	D.	L. A.	r.
40	Jefferis	m.	v. g.	D.	A.	....
41	Jonathan	m.	v g.	D.	W.	....
42	Kilham Hill	m.	g.	M.	W.	....
43	King of Tompkins County	l.	b.	M.	W.	r.
44	King Sweeting	m.	b.	F.	S.	h. r.
45	Large Yellow Bough *Sweet Bough.*	l.	g.	M.	S.	....
46	Loudon Pippin	l.	g.	M.	W.	?
47	Maiden's Blush	m.	g.	M.	A.	....
48	Minister	m.	v. g.	D. M.	W.	r.
49	Milding	l.	v. g.	M.	W.	....
50	Moses Wood	m.	v. g.	C. D.	E. A.	....
51	Mother	m.	b.	D.	E. W.	....
52	Mountain Sweet	m.	g.	M.	W.	....
53	Munson Sweet	....	g.	D. M.	....	h. r.

APPLES—Continued.

Number.	Central Division.	Southern Division.	REMARKS.
27	?	....	Quite extensively introduced with early importations of New York nursery stock. [Condemned in Androscoggin County.]
28	?	?	
29	r.	r.	An excellent sweet apple for family use.
30	r.	r.	Can hardly be recommended for general cultivation. Too small for market.
31	h. r.	....	Not that of the books. Extensively grown in the central part of the State, and wherever grown is a popular apple.
32	†	r.	Two or more varieties are grown in the State under this name. The one here described is the true Golden Ball of Downing. An early and annual bearer; tree vigorous and hardy. The description in the first catalogue was erroneous.
33	h. r.	h. r.	Reported a shy bearer in Piscataquis. Heads the list of fall fruits. A heavy bearer in Androscoggin County.
34	?	?	Not extensively introduced. (See page 128.)
35	r.	h. r.	
36	?	?	An excellent winter sweet apple.
37	h. r.	h. r.	
38	r.	r.	
39	r.	r.	Under high cultivation profitable—otherwise fruit imperfect.
40	....	?	Not extensively grown in this State.
41	....	?	Excellent dessert apple. Not much grown in this State.
42	†	†	Not generally popular.
43	?	?	Is not fully proved. With many does not prove desirable. Shy bearer in Western Kennebec. Good bearer in Androscog'n Co.
44	h. r.	h. r.	Origin, Sidney, Maine. Valuable for family use.
45	r.	r.	Valuable chiefly because so early. When fully ripe quality "very good."
46			
47	†	....	A very handsome apple.
48	r.	r.	An early, great, and continuous bearer.
49	?	....	A new variety from New Hampshire. Promises well.
50	r.	r.	
51	r.	r.	A choice dessert apple Tree considered a little tender and short lived, though Cole calls it perfectly hardy.
52	r.	....	A new variety. Origin, Greene, Me. Promising.
53	....	....	Hardy. A very great bearer.

CATALOGUE OF

Number.	NAME.	Size.	Quality.	Use.	Season.	Northern Division.
54	Naked-limbed Greening..........	m.	g.	M.	W.	h. r.
55	Northern Spy	l.	b.	M. D.	W.	h. r.
56	Orange Sweet....................	m.	v. g.	M.	A.	r.
57	Peck's Pleasant..................	m.	v. g.	D.	W.	....
58	Porter............................	m.	v. g.	M.	A.	r.
59	President	l.	g.	D. M.	A.	....
60	Primate...........................	m.	b.	D.	S.	....
61	Pumpkin Sweet	l.	b.	F.	L. A.	r.
62	Rambo............................	m.	v. g.	M.	W.	....
63	Red Astrachan....................	m	g.	F. M.	S.	h. r.
64	Red Canada .... *Old Nonsuch.*	m.	v. g.	D. M.	W.	†
65	Ribston Pippin	m.	v. g.	D. M.	W.	r.
66	Rhode Island Greening...........	l.	b.	M.	W.	†
67	Roxbury Russet	m.	g.	M.	Sp.	†
68	Sarah	l.	g.	C.	A.	r.
69	Sops of Wine .... *Bell's Early.*	m.	g.	M.	S.	r.
70	Somerset........................	l.	b.	D. M.	A.	h. r.
71	Starkey	m.	b.	D. M.	E. W.	....
72	Superb Sweet	m.	b.	D. M.	A.	....
73	Sweet Russet	l.	v. g.	F. M.	E. W.	....
74	Sweet and Sour	l.	v. g.	F.	W.	....
75	Swaar	l.	v. g.	D. M.	W.	?
76	Summer Sweet Paradise	l.	v. g.	F. M.	E. A.	....
77	Talman's Sweet.................	m.	v. g.	F. M.	W.	h. r.
78	Tetofsky	s.	p. ?	D.	S.	h. r.
79	Thompson	m.	v. g.	M.	E. A.	†

APPLES—Continued.

Number.	Central Division.	Southern Division.	REMARKS.
54	h. r.	....	Grown extensively in Waldo county.
55	h. r.	h. r.	Slow to come into bearing, but when it does, under high cultivation, proves desirable.
56	r.	....	Highly recommended by many.
57	?	?	
58	h. r.	h. r.	
59	r	r.	Second only to Gravenstein. Tree perfectly hardy and a heavy and annual bearer.
60	r.	r.	
61	h. r.	h. r.	Good for baking,—very sweet. Also good market apple. Succeeds well in portions of Northern Division.
62	?	?	Popular in the West. A good bearer, but too small for profit.
63	h. r.	h. r.	Popular everywhere. Quite tart unless fully ripe.
64	†	†	Not as profitable as many other newer varieties.
65	†	†	Not universally profitable. In some localities proves a good bearer. A poor bearer in Western Kennebec.
66	h. r.	h. r.	
67	r.	r.	Cannot be generally recommended for all localities. On soils adapted to it, proves one of the most profitable. On other soils it is a very poor bearer. Needs high cultivation.
68	....	....	Native of Wilton. Great bearer.
69	r.	r.	Extensively grown under the synonym. Hardy, productive and profitable. Tree a poor grower in Western Kennebec.
70	h. r.	h. r.	Native of Mercer. Showy. Fruit every way valuable. Said by some to drop badly.
71	h. r.	?	Native of Vassalboro', where it is extensively grown and called one of the most profitable. Quality among the best.
72	r.	....	An excellent apple, though not extensively grown.
73	?	?	There are many kinds grown under this name, with nothing to recommend them but their late keeping and their exceeding sweetness This variety is large and has much to recommend it as an early winter sweet apple. Good for baking.
74	....	....	This variety grows with sections of sweet alternating with sour. Choice for dessert. Grown chiefly as a curiosity.
75	?	?	
76	?	....	An old variety. A desirable early sweet apple. Not widely grown.
77	h. r.	h. r.	More extensively grown than any other winter sweet apple. Tree hardy, prolific.
78	r.	r.	Tree hardy everywhere.
79	†	†	A good fruit. Tree not a free grower nor abundant bearer, except in special localities.

CATALOGUE OF

Number.	NAMES.	Size.	Quality.	Use.	Season.	Northern Division.
80	Twenty Ounce........................ *Cayuga Red Streak.*	l.	p.	C.	L. A.	†
81	Wagener........................	m.	g.	M.	W.	....
82	Williams' Favorite..............	l.	g.	M.	S.	h. r.
83	Winthrop Greening...............	l.	b.	F. M.	A.	h. r.
84	Winter White	l.	g.	M.	W.	?
85	Yellow Bellflower..............	m.	b.	D. M.	W.	h. r.
86	Yellow Newtown Pippin	m.	b.	D.	W.	....

APPLES—Concluded.

Number.	Central Division.	Southern Division.	REMARKS.
80	†	†	Large, coarse, acid, not rich.
81	?	?	A poor grower in Western Kennebec; overbears.
82	h. r.	h. r.	Succeeds well in portions of Northern Division. Very large, free grower and good bearer.
83	r.	r.	One of our best native varieties. Desirable in many respects.
84	†	†	An old variety introduced by Mr. Vaughn. Grown to some extent in Kennebec, where some speak highly of it. It is not recommended over some newer varieties.
85	r.	r.	Hardy, giving good satisfaction in many localities. On favorable soils an abundant bearer, when it is crisp, juicy and rich. When not well grown, quality as inferior as its size.
86	?	?	Not extensively grown In some instances proving well. Quality poor in Western Kennebec; does not ripen well.

II—PEARS.

The columns explain as follows: "Size"—s, small; m., medium; l., large. "Form"—p., pyriform; ob. p., obtuse pyriform; ob. o. p., oblong obtuse pyriform; r., roundish; r. ob., roundish obtuse. "Color"—y. g., yellowish green; y. g. r., yellowish green with red cheek; y. r., yellow russet; y., yellow. "Quality"—g., good; v. g., very good; b., best. "Use"—F., family; F. M., family and market; M., market; K., kitchen. "Season"—S, summer; A., autumn; E. A., early autumn; L. A., late autumn; W., winter. The letter q affixed to the name of a variety indicates that it is adapted to be grown on the quince stock.

Number.	NAMES.	Size.	Form.	Color.	Quality.	Use.	Season.
1	Bartlett	l.	ob. o. p	y.	v. g.	F. M.	E. A.
2	Belle Lucrative, q	m.	r. o. p.	y. g.	b.	F.	E. A.
3	Beurre Bosc	l.	p.	y. r.	b.	F. M.	L. A.
4	Beurre Clairgeau	l.	p.	y. r.	g.	M.	L. A.
5	Beurre d'Anjou, q	l.	ob. p	y. g. r.	b.	F. M.	L. A.
6	Beurre Diel, q.	l.	r. ob p.	y. r.	v. g.	F. M.	L. A.
7	Beurre Giffard, q	m.	p.	y. g.	v. g.	F. M.	S.
8	Beurre Superfin, q	m.	r. p.	y. r.	v. g.	F.	A.
9	Beurre Hardy, q	l.	ob. p.	y. g.	g.	F. M.	A.
10	Clapp's Favorite, q	l.	ob o. p	y. g. r.	g.	F. M.	E. A.
11	Dearborn's Seedling	s.	r. p.	y.	v. g.	F. M.	E. A.
12	Doyenne d'Ete	s.	r. o. p.	y g. r.	v. g.	F.	S.
13	Duchess d'Angouleme, q.,	l.	ob. o. p.	y.	v. g.	F. M.	L. A.
14	Eastern Belle	m.	r. o. p.	y.	b.	F.	A.
15	Fulton	s.	r. ob.	y. r.	b.	F. M.	A.
16	Glout Morceau, q	l.	ob. p.	y.	g.	....	L. A.
17	Goodale	l.	ob. o p.	y. g.	v. g.	F. M.	A.
18	Howell, q.	l.	r. p.	y. g.	v. g.	F. M.	A.
19	Lawrence	m.	r. o. p.	y. g. r	v. g.	F.	W.
20	Louise Bonne de Jersey, q	l.	ob. p.	y. g.	v. g.	F. M.	A.
21	Manning's Elizabeth	s.	ob. p.	y. r.	v. g.	F.	S.
22	Rostiezer	s.	p.	y. g. r.	b.	F.	E. A.
23	Sheldon	m.	r.	y. r.	b.	F. M.	A.
24	Urbaniste	m.	p.	y. g.	v. g.	F. M.	L. A.
25	Vicar of Winkfield, q	l.	p.	y. g.	p.	K. M.	W.
26	Winter Nelis	s.	ob. p.	y. r.	b.	F.	W.

Remarks on the List of Pears.

Nos. 10, 11, 14, 15, 17, 18, 19 and 23, are of American origin; the others foreign. Nos. 14, 15 and 17 are natives of Maine.

No. 1—*Bartlett.* Tree somewhat tender, and hence liable to injury from sudden changes of temperature in winter.

No. 2—*Belle Lucrative.* One of the best at its season as a single variety for home use.

No. 3—*Beurre Bosc.* Tree vigorous and a regular bearer. Fruit generally perfect and of uniform size and high color.

No. 4—*Beurre Clairgeau.* Succeeds best on light, warm soils. Forms a fine, thrifty tree, and bears early. Valuable for market.

No. 5—*Beurre d' Anjou.* In some localities bears lightly,—otherwise nearly faultless, both in tree and fruit. A poor bearer in Western Kennebec.

No. 6—*Beurre Diel.* First rate in every respect in favorable situations; but on young trees and in cold soils the fruit is apt to be coarse and astringent.

No. 7—*Beurre Giffard.* Tree of moderate growth, spreading, slender. Like all early pears, this should be gathered before fully ripe, otherwise it is liable to lack quality, and decay at the core.

No. 8—*Beurre Superfin.* Trees very healthy—inclined to be thorny. Not an early bearer.

No. 9—*Beurre Hardy.* Trees remarkably vigorous.

No. 10—*Clapp's Favorite.* Fruit showy and attractive. Tree a vigorous grower. Very popular.

No. 11—*Dearborn's Seedling.* Regular and abundant bearer. Fruit sweet and sprightly in flavor.

No. 12—*Doyenne d' Ete.* Must be gathered before fully ripe.

No. 13—*Duchess d' Angouleme.* Gives its best fruit on quince stock, with garden culture.

No. 14—*Eastern Belle.* Originated at Bangor. Tree hardy and vigorous. Fruit large and of execllent quality.

No. 15—*Fulton.* Should be grafted into vigorous trees.

No. 16—*Glout Morceau.* Tree of spreading habit. Unreliable in heavy soils.

No. 17—*Goodale.* Very vigorous and productive; fruit having a short stem, is liable to blow off.

No. 18—*Howell.* Tree hardy, and an upright and free grower.

No. 19—*Lawrence.* Succeeds in more sandy soils than most pears.

No. 20—*Louise Bonne de Jersey.* As No. 13.

No. 21—*Manning's Elizabeth.* A beautiful dessert fruit; desirable for amateurs; very productive; growth moderate.

No. 22—*Rostiezer.* Tree vigorous, but of irregular and straggly growth.

No. 23—*Sheldon.* Tree vigorous, hardy and a good bearer; quality fine.

No. 24—*Urbaniste.* Of slow growth on quince, but when grown is one of the best in quality, and most permanent and productive.

No. 25—*Vicar of Winkfield.* The best cooking pear. When of large size, by suitable thinning, and ripened yellow, is good for eating.

No. 26—*Winter Nelis.* Should be grafted into vigorous trees.

III—QUINCES.

Angers. Fruit very large, oblate pyriform, yellowish, tender. This variety is grown and known chiefly as a stock for dwarf pears.

Apple or *Orange.* Fruit large, roundish, yellowish green, half tender. Valuable for home use or in market, for preserves, &c.

IV—PLUMS.

ABBREVIATIONS: "Size"—l., large; m., medium; s., small. "Form"—r., roundish; o., oval; r. o., roundish oval; o. ob., oval obovate. "Color"—p., purplish or very dark; r., reddish or copper color; y., yellow; g. y., greenish yellow; y. r., yellowish with shades or spots of red. "Quality"—g., good; v. g., very good; b., best. "Use"—F., family; M., market. "Season"—E., early; M., medium; L., late.

Number.	NAMES.	Size.	Form.	Color.	Quality.	Use.	Season.
1	Bavay's Green Gage.... *Reine Claude de Bavay.*	l.	r.	g. y.	b.	F.	L.
2	Bleeker's Gage.	m.	r. o.	y.	v. g.	F. M.	M.
3	Bradshaw..	l.	o. ob.	r. p.	g.	M.	M.
4	Coe's Golden Drop......	l.	o.	y. r.	v. g	F. M.	L.
5	Coe's Late Red	m.	r.	p.	v. g.	F. M.	L.
6	Columbia	l.	r.	p.	g.	M.	M.
7	Damson...............	s.	o.	p.	g	M.	L.
8	Duane's Purple	l.	o.	r. p.	g.	F M.	E.
9	Green Gage............	s.	r.	g. y.	b.	F.	M.
10	Huling's Superb........	l.	r o.	g. y.	g.	F. M.	M.
11	Imperial Gage..........	l.	o.	g. y.	b.	F. M.	M.
12	Jefferson	l.	o.	y. r.	b.	F. M.	M.
13	Lombard	m.	r. o.	r. p.	g.	M.	M.
14	McLaughlin............	l.	r.	y. r.	b.	F. M.	M.
15	Purple Gage...........	m.	r.	p.	v. g.	F. M.	M.
16	Smith's Orleans	l.	o.	r. p.	v. g.	F. M.	M.
17	Washington............	l.	r. o.	g. y.	v. g	F. M.	E.
18	Yellow Egg .. .. *White Magnum Bonum.*	l.	o	y.	g.	F. M.	M.

V—CHERRIES.

ABBREVIATIONS: "Size"—l., large; m, medium; s., small. "Form"—ob. h., obtuse heart shape; r. ob. h., roundish obtuse heart shape; r. h., roundish heart shape; r., roundish or round. "Color"—l r., lively bright red; d. r., red, almost black; a. m., amber mottled with red; y. r., yellow ground shaded with red. "Class"—H., Hearts, or tender fleshed sweet cherries; B., Bigarreau, or firm fleshed; D., Dukes, having a character in tree and fruit midway between the Hearts and Morellos; M., Morellos, having acid fruit, and the trees of small, slender growth. "Use"-F., family, for dessert; F. M., family or market; K. M., cooking or market; M., market. "Season"—E., early; M., medium; L, late. For general descriptions see pages 78-81.

Number.	NAMES.	Size.	Form.	Color.	Class.	Use.	Season.
1	Belle de Choisy..... ...	m.	r.	a. m	D.	F.	E. M.
2	Belle Magnifique.......	l.	r. h.	l. r.	D.	K. M.	L.
3	Black Heart	l.	r. h.	d. r.	H.	F. M.	M.
4	Black Tartarian.......	l.	r. h.	d. r.	H.	F. M.	M.
5	Coe's Transparent.......	m.	r.	a. m.	H.	F.	M.
6	Early Purple Guigne....	m.	r. h.	d. r.	H.	F. M.	E.
7	Early Richmond	s.	r.	l. r.	M.	K. M.	E.
8	Elton.........	l.	r. h.	y. r.	B.	F. M.	M.
9	Governor Wood.........	l.	r. h.	y. r.	H.	F. M.	M.
10	Late Duke	l.	ob. h.	d. r.	D.	K M.	L.
11	Louis Philippe..........	l.	r.	d. r.	D.	K M.	L.
12	May Duke..............	l.	r. ob. h.	d. r.	D.	K. M.	E.
13	Morello................	l.	r. h.	d. r.	M.	K. M.	L.
14	Napoleon	l.	r. ob. h.	y. r.	B.	F. M.	M.
15	Reine Hortense.........	l.	r.	l. r.	D.	F. M.	L.

VI—NATIVE GRAPES.

ABBREVIATIONS: "Size"—with reference to the berry, l., large; m., medium; s., small. "Form"—with reference to bunch and berry, s. r., short bunch, round berry; l. r., large and round; m. r. o., medium bunch, roundish oval berry; m. r., medium bunch, round berry. "Color"(when fully ripe)—b., black, or nearly so; r., reddish; g., greenish white or yellowish. "Quality"—p., poor; g., good; v. g., very good; b., best. "Use"—T., table; M., market; W., wine.

Number.	NAMES.	Size.	Form.	Color.	Quality.	Use.	Season.
1	Allen's Hybrid..........	l.	l. r.	g.	v. g.	T. M.	M.
2	Agawam	l.	s. r. o.	r.	v. g.	....	M.
	Rogers' No. 15.						
3	Clinton................	s.	m. r.	b.	p.	T. W.	L.
4	Concord	l.	l. r.	b.	g.	T. M. W.	M.
5	Creveling..............	m.	m. r. o	b.	v. g.	T.	E.
6	Delaware	s.	s. r.	r.	b.	T. M. W.	E.
7	Diana..................	m.	s. r. o.	r.	v. g.	T. M.	L.
8	Eumelan	m.	r.	b.	g.	T.	M.
9	Hartford Prolific	l.	m. r. o.	b.	g.	M.	E.
10	Iona	m.	m. r. o.	r.	b.	T. M. W.	L.
11	Isabella................	l.	m. r. o.	b.	g.	T. M.	L.
12	Lindley................	m.	m. r. o.	r.	v. g.	T.	M.
	Rogers' No. 9.						
13	Merrimack	l.	s. r.	b.	v. g.	M.	M.
	Rogers' No. 19.						
14	Moore's Early..........	l.	l. r.	b.	g.	T. M W.	E.
15	Pocklington............	l.	l. r.	g.	g.	T. M.	M.
16	Rebecca	m.	s. r.	g.	v. g.	T.	M.
17	Salem..................	l.	r.	p.	g.	M.	M.
	Rogers' No. 22.						
18	Telegraph..............	l.	m. r. o.	b.	v. g.	T. M.	E.
	Christine						
19	Wilder	l.	l. r.	b.	v g.	T. M.	M.
	Rogers' No. 4.						
20	Worden	l.	l. r.	b.	g.	T. M. W.	E.

REMARKS ON THE LIST OF GRAPES.

No 1—*Allen's Hybrid.* A luxuriant grower and abundant bearer, and when well ripened one of the most delicious varieties of the Sweetwater class; but rather too late to be recommended for general culture in this State.

No. 2—*Agawam.* Very handsome, and a good keeping variety. Flavor rich, spicy and good.

No. 3—*Clinton.* Fruit small, late and harsh. Valuable only for wine. Vine hardy. Not recommended.

No. 4—*Concord.* A free grower, and bears heavily, but does not generally mature its fruit in this State.

No. 5—*Creveling.* Of excellent quality, not rich, but entirely free from foxiness. Mildews badly in some localities.

No. 6—*Delaware.* Bunch and berry small, and not a good keeper, but in all other respects one of the most desirable varieties for general cultivation. Vine healthy and hardy, and an early and constant bearer. Requires rich soil and high culture.

No. 7—*Diana.* Rather late for Maine, but of fine quality, and the best keeping variety.

No. 8—*Eumelan.* Has not given satisfaction in this State.

No. 9—*Hartford Prolific.* Early, hardy, vigorous and productive, but fruit ripens unevenly and drops from the bunch.

No. 10—*Iona.* Of high flavor and a good keeper, but too late for general cultivation in Maine. Requires rich, warm soil. Vine and foliage healthy.

No. 11—*Isabella.* An old, standard variety. Largely superseded by earlier and better sorts. A free grower, and hardy.

No. 12—*Lindley.* One of the earliest and best of Rogers' hybrids. Bunch and berry handsome. Of good quality and excellent keeper.

No. 13—*Merrimack.* Ripens uniformly and well, and gives general satisfaction. Vigorous and productive.

No. 14. *Moore's Early.* Seedling of Concord, which it closely resembles, but ripens a week or ten days earlier.

No. 15. *Pocklington.* Strong grower, hardy, free from mildew; very promising.

No. 16—*Rebecca.* Of fine flavor and keeps well. Of slender growth and tender when young, but a healthy grower when established.

No. 17—*Salem.* Not as reliable in this State as the other well known varieties of the same class. Foliage liable to mildew. Flavor rich, aromatic and sweet. Needs further trial.

No. 18—*Telegraph.* Not much known in this State, but highly recommended elsewhere for earliness and general good qualities.

No. 19—*Wilder.* Vigorous. Foliage strong and healthy. Requires a strong, rich soil. A reliable and valuable variety but a little later than some others of its class.

No. 20. *Worden.* Similar to Concord, but of better quality, earlier and less liable to rot.

VII—FOREIGN GRAPES.

The catalogue of the American Pomological Society contains thirty-three varieties of foreign grapes, nearly all of which, with many others, are grown in this State; and being cultivated exclusively under glass they are exempt from the variations induced by climate and soil, and therefore equally adapted to all localities. The description embraces color, flavor, season, and the character of the vinery—whether hot or cold—in which they may be grown. It is not perceived that the insertion of such a list will be of material service to cultivators of this class of grapes, the information which it would contain being within their reach in other forms; hence it is omitted.

VIII—BLACKBERRIES.

ABBREVIATIONS: "Size"—l., large; m., medium. "Form"—ob. c., oblong conic; ov., oval; ob. ov., oblong oval. "Quality"—v. g., very good; b., best. "Season"—E., early; M., medium; L., late.

Number.	NAMES.	Size.	Form.	Quality.	Season.
1	Snyder	m.	ob. c.	b.	M.
2	Agawam	m.	....	b.	M.

1, Hardy and productive. 2, Hardy, productive and sweet.

IX—CURRANTS.

ABBREVIATIONS: "Size"—l., large; m., medium; s., small. "Form of bunch"—m., medium; s., short; l., long. "Color"—r., red; b., black; w., white. "Quality"—a., acid; m. a., moderately acid; v. a., very acid. "Season"—E., early; M., medium; L., late.

Number.	NAMES.	Size.	Form of Bunch.	Color.	Quality.	Season.
1	Black Naples.	l.	s.	b.	m. a.	M.
2	Black Grape. *Ogden's Black*	l.	m.	b.	m. a.	M.
3	Cherry	l.	s.	r.	v. a.	M.
4	Fay's Prolific	l.	l.	r.	a.	M.
5	Imperial Red	l.	s.	r.	a.	M.
6	La Versaillaise	l.	s.	r.	a.	M.
7	White Grape	m.	m.	w.	m. a.	E.

2 Resembles Black Naples, but more vigorous and productive; fruit larger and of better quality. 3, Shy bearer, and very sour. 5, Generally supposed to be identical with No. 6; but inserted by vote of the Society (p. 103) for further investigation. 7, The best white currant.

X—GOOSEBERRIES.

ABBREVIATIONS: "Size"—l., large; m., medium; s., small. "Form"—o., oval; r. o., roundish oval. "Color"—r., reddish; g., greenish yellow. "Quality"—g., good; v. g., very good. "Season"—E., early; M., medium; L., late.

No.	NAMES.	Size.	Form.	Color.	Quality	Season.
1	Downing	m.	r. o.	g.	v. g.	M. L.
2	Houghton	s.	r. o.	r.	g.	E.

1 Of upright habit, productive, desirable. 2 Drooping, vigorous.

XI—RASPBERRIES.

ABBREVIATIONS: "Size"—l., large; m., medium. "Form"—r., roundish; c., conical; ob. c., obtuse conical. "Color"—r., reddish; p., purplish; y, yellow; b., black. "Quality"—g, good; v. g., very good; b., best. "Use"—M., market; F. M., family and market. "Season"—E., early; M., medium; L, late.

No.	NAMES.	Size.	Form.	Color.	Quality.	Use.	Season.
1	Clarke	m.	r.	r.	v. g	F. M.	E.
2	Cuthbert	l.	ob. c.	....	....	F. M.	L.
3	Davison's Thornless	m.	r.	b.	g.	F. M.	E.
4	Golden Thornless	m.	r.	y.	g.	F.	M.
5	Gregg	l.	r.	blk.	g.	F. M.	L.
6	Knevett's Giant	l.	ob. c.	r.	b.	F.	M.
7	McCormick *Mammoth Cluster.*	m.	ob c.	b.	v. g.	F. M.	L.
8	Orange. *Brinckle's Orange*	l.	c.	y.	b.	F.	M.
9	Shaffer's Colossal	l.	c.	purple.	g.	M.	L.
10	Turner	m.	r.	r.	v. g.	F. M.	E.

1, Canes strong, vigorous and upright; more nearly hardy than any foreign kind; fruit rather soft, juicy, sweet and excellent; better for light soils than any other variety of its class. 6, Strong grower and very productive. 8, Fruit tender; valuable for family use. 7, Profitable for market.

XII—STRAWBERRIES.

ABBREVIATIONS: "Size"—l., large. "Form"—o. c., obtuse conical; r. c., roundish conical; r. o. c., roundish obtuse conical. "Color"—b. s., bright scarlet; l. c., light crimson; d. c., deep crimson. "Quality"—g., good; v. g., very good. "Season"—E., early; M., medium; L., late.

No	NAMES.	Size.	Form.	Color.	Quality.	Season.
1	Bidwell	m. to l.	long.	b. s.	v. g.	M.
2	Crescent Seedling	m.	r. c.	l. c.	g.	M.
3	Cumberland Triumph	m. to l.	r. o.	l. c.	v g.	M.
4	Charles Downing	m. to l.	r. o. c.	b. s.	v. g.	M.
5	Glendale	m. to l.	o. c.	b. s.	v. g.	L.
6	Kentucky Seedling	l.	r. o. c.	l. c.	v. g.	L.
7	Manchester	l.	r. o. c.	b. s.	v. g.	M. to L.
8	Sharpless	l.	irregular	l. c.	v. g.	M.
9	Wilson's Albany	l.	r. c.	d. c.	g.	E. to L.

1, Has the objection of having light tips. 2, A pistillate variety; very productive; quality better than the Wilson. 3, One of the best for family use. 4, Quality very good; rusts badly. 5, Very high flavored and productive. 6, One of the best late varieties in quality. 7, Pistillate; matures its fruit well. 8, A popular sort; fruit very large; requires hill culture. 9, Of fair quality when fully ripe.

GEO. B. SAWYER, *Treasurer*,

IN ACCOUNT WITH MAINE STATE POMOLOGICAL SOCIETY.

DR.

To cash in treasury January 1, 1885	$85 50	
" amount rec'd from Oakland National Bank, on temporary loan	300 00	
" " from the State, bounty for 1884	500 00	
" " of life members	40 00	
" " " annual members	59 00	
" " " State Agricultural Society	425 00	
" " for interest on Permanent Fund	17 20	
" " " " extra dividend of Wiscasset Savings Bank	22 36	
		$1,449 06

CR.

By amount paid orders of Executive Committee	$251 13	
" " on account of Secretary's salary	75 00	
" " loan at Oakland National Bank	300 00	
" " interest on loans	15 15	
" " balance premiums of 1884	441 00	
" " on account of premiums of 1885	354 00	
	$1,436 28	
Balance cash in treasury December 31, 1885	12 78	
		$1,449 06

STATEMENT OF THE FINANCIAL CONDITION OF THE SOCIETY, DECEMBER 31, 1885.

ASSETS.

Amount due from State, bounty for 1885	$500 00	
Cash in the treasury	11 78	
Property owned by the Society, estimated	150 00	
Amount on deposit to credit of Permanent Fund	344 40	
		$1,006 18

LIABILITIES.

Amount due on loan	$200 00	
" " premiums of 1885	354 00	
" " unpaid orders (nothing)		
" " salary of Secretary and Treasurer, 1885	25 00	
" " bills not rendered, or for which orders have not been drawn, estimated	100 00	
		$679 00

PERMANENT FUND.

Cr. By fees of 82 life members	$820 00	
Dr. To amount on deposit to credit of Fund	344 40	
Balance due Fund		$475 60

Respectfully submitted.

GEO. B. SAWYER, *Treasurer*.

WISCASSET, Feb. 15, 1886.

MEMBERS OF THE SOCIETY.

NOTE—Any errors or changes of residence should be promptly reported to the Secretary. Members will also confer a favor by furnishing the Secretary with their full Christian names where initials only are given.

LIFE MEMBERS.

Andrews, A. Emery............Gardiner
*Atherton, H. N..............Hallowell
Atherton, W. P.............. "
Atkins, Charles G ....Bucksport
Atwood, Fred ....Winterport
Bennoch, John E................Orono
Briggs, D. J.............South Turner
Briggs, John....................Turner
Burr, John...................Freeport
Carter, Otis L.....................Etna
Chase, Henry M........North Yarmouth
Chase, Martin V. B ....Augusta
*Clark, Eliphalet..............Portland
Cole, Horatio G ....Boston
Crafts, Moses..................Auburn
*Crosby, William C ....Bangor
Dana, Woodbury S ....Portland
DeRocher, Peter............ Waterville
Dirwanger, Joseph A...........Portland
Dunham, W. W.............North Paris
Dyer, Milton ....Cape Elizabeth
*Emerson, Albert ....Bangor
Farnsworth, B. B..............Portland
Frost, Oscar F...............Monmouth
Gardiner, Robert H............Gardiner
Gilbert, Z. A.............North Greene
*Godfrey, John E ....Bangor
Hanscom, John....................Saco
Harlow, S. C....................Bangor
*Harris, N. C ....Auburn
Harris, N. W.................. "
Harris, William M............. "
*Hersey, T. C ....Portland
Hopkins, Miss S. M............Gardiner
Hoxie, James S..........North Fairfield
Ingalls, Henry...............Wiscasset
*Jewett, George...............Portland
Johnson, Isaac A ....Auburn
Jordan, Francis C............Brunswick
Knowlton, D. H ....Farmington
Low, Elijah ....Bangor
Low, S. S .... "
Lapham, E. A...................Pittston
McLaughlin, Henry ....Bangor
*Metcalf, M. J ....Monmouth
Moore, William G............ "
Moor, F. A..................Waterville
Morton, J. A ....Bethel
Morton, William E............Portland
*Noyes, Albert ....Bangor
Perley, Chas. I....Seward's (Vassalboro')
Pope, Charles S ....Manchester
Pulsifer, D. W...................Poland
*Richards, F. G...............Gardiner
Richards, John T............. "
Ricker, A. S....................Turner
*Richardson, J. M ....Gardiner
Roak, George M.................Auburn
Robinson, Henry A ....Foxcroft
Rolfe, Samuel.................Portland
Sawyer, Andrew S........Cape Elizabeth
Sawyer, George B............Wiscasset
Shaw, Stillman W..................Minot
Simmons, H. J. A ....Waldoboro'

*Deceased.

LIFE MEMBERS—CONCLUDED.

*Smith, Alfred................Monmouth
Smith, Henry S............. “
Starrett, L. F....................Warren
*Stetson, Isaiah..................Bangor
Stilphen, Asbury C ....Gardiner
Stanley, Charles..............Winthrop
Stanley, O. E................. “
Strout, S. F.............West Falmouth
Strattard, Mrs. A. B............Monroe
Sweetser, S. R........Cumberland Center
*Taylor, Joseph...............Belgrade
Thomas, William W., Jr.......Portland
Tilton, William S...............Chelsea
True, Davis P.............Leeds Center
Varney, James A................Oregon
Vickery, James ....Portland
Vickery, John ....Auburn
Wade, Patrick.................Portland
*Weston, James C...............Bangor
Wharff, Charles S.............Gardiner
Whitney, Edward K...........Harrison
Woodman, George W...........Portland

*Deceased.

ANNUAL MEMBERS, 1885.

Abbott, Lyman F............. Lewiston
Ayer, Daniel............N. Vassalboro'
Allen, B. E..............North Greene
Allen, Nelson S.............Dennysville
Blossom, Leander H.......Turner Centre
Berry, L. M..................Winthrop
Blossom, G. W..................Turner
Boardman, Samuel L...........Augusta
Baker, John C.................Lewiston
Brown, Henry W ....Newburg
Bickford, L. I...........Dixmont Centre
Bigelow, Hayden ....Greene
Carpenter, James M ....Pittston
Colby, D. H..................Lewiston
Cary, Henry S ....Topsham
Cates, A. G......................Auburn
Chipman, J. C..........West Gloucester
Chipman, A. B.......... “ “
Cook, S. W ....Lewiston
Clifford, Mrs. A. T.........Leeds Centre
Dunton, John.................Lewiston
Dunbar, E. W.............Damariscotta
Espeonnet, Albert.............Gardiner
George, C. H..................Hebron
Hoffses, Elmas..................Warren
Ham, Nelson...................Lewiston
Hayes, L. B.................. “
Hackett, E. C...........West Gloucester
Holbrook, C. D..............N. Madison
Hersom, A. J...................Berwick
Hosman, George H..............Auburn
Harmon, G. H................. “
Huff, A. B..............Readfield Depot
Hoyt, Mrs. F.................Winthrop
Jordan, Alice M...............Auburn
Kenniston, E. H........Simpson's Corner
Litchfield, L. K...............Winthrop
Leach, H. T..............E. Monmouth
Lombard, T. M..................Auburn
Leavitt, Mrs. S. E.............. “
Merrill, T. M...........West Gloucester
Mitchell, E L.................Lewiston
Miller, Mrs. C. A.............. “
Nowell, Frank E ....Fairfield
Nelson, O. C...........New Gloucester
Perkins, L. J ....Deering
Penley, Arthur W...............Auburn
Pulsifer, Eben............South Auburn
Phaneuf, Mrs. M...............Lewiston
Robie, S. P.....................Auburn
Ring, Cora E..................Richmond
Staples, G. K....................Temple
Skillings, L...................Lewiston
Towle, J. J.....................Dixfield
Thomas, Mrs. J. W............Rockland
Whitmore, Thomas P.......Bowdoinham
Wharff, William R.............Gardiner
Wright, Fred........................Bath
Waterman, I. T............East Auburn
Whitney, E. K.................Harrison

INDEX TO AGRICULTURAL REPORT.

INDEX TO POMOLOGICAL REPORT.

APPENDIX.

THE

SPHINGIDÆ

OF

NEW ENGLAND.

C. H. FERNALD, A. M.

Orono, February, 1886.

AUGUSTA:
SPRAGUE & SON, PRINTERS TO THE STATE.
1886.

The Sphingidæ of New England.

INTRODUCTION.

The following paper contains an account of all the species of the SPHINGIDÆ known to occur in New England, most of which have already been discovered in Maine, and when the south-western part of the State shall have been fully explored by entomologists, it is not improbable that they will all be found to occur more or less frequently in this State.

It is not intended in this paper to discuss the classification of these moths, for that would require a larger amount of material and a more complete literature of the subject than we have at hand. There is need, however, of an entire revision of the species of this group, from all parts of the world, and this revision should be based on an exhaustive study of all their structural characters, a study which we do not think they have yet received as a whole.

The SPHINGIDÆ of North America have been studied by Harris, Clemens, Walker, Butler, and by Grote, who has written more than all others and to whom we owe very much for the knowledge we possess of these moths. Lintner has published some papers on the early stages, which are models of fullness and accuracy. J. B. Smith has recently given a short preliminary paper on these moths, in the Entomologica Americana Vol. 1 p. 81, which is very suggestive, and we have adopted many of his conclusions.

Names and Habits.

The species of this family of insects, usually located next below the butterflies, were placed by Linneus in his genus Sphinx, and are known by the common name of Sphinx moths, because of the curious habit which their caterpillars or larvæ have of raising the anterior segments of their bodies and remaining motionless in this position for some time, thus bearing a fancied resemblance to the fabled Sphinx, and from this, the family name, Sphingidæ, has been derived. They are sometimes called hawk moths, because of the strength and velocity of their flight; and they are also called humming-bird moths, because they poise on the wing before the flowers while drawing up the nectar, in the same manner as humming birds. The insects of one group have the middle portion of the wings transparent and on this account are called clear-wings.

The larvæ of some of these moths feed on the leaves of shrubs or trees which are of no special value except for ornamental purposes, while others attack our more valuable plants, and although parasitic insects, fungoid diseases and the birds — their natural enemies — generally hold them in check so that the amount of damage they do is comparatively small, yet they become so numerous at times that the amount of damage done by them far exceeds anything we could imagine. Some of these moths may be seen flying around flowers in the hot sunshine, while others hover around them in the twilight, or even later in the evening.

Early Stages.

The female moth lays her eggs singly on the leaves of those plants which serve as food for the young. These eggs are more or less globular, varying, in the different species, from pale green to creamy white, and have a smooth surface, though in some, they are finely reticulated or granulated. These eggs hatch in from one to two weeks, and the young caterpillars or larvæ of some of the species at least, make their first meal on the egg-shell, after which they wander about for a short time till they find a place to their liking, usually on the edge of a leaf, when they begin to feed. When first hatched they are usually of a pale or yellowish green color, and the surface of their bodies is covered with short, erect hairs. The head is much larger than any of the following segments, and there is a stout, straight or curved spine in most of the species, arising from the top of the twelfth segment, inclining backwards, which is called the *caudal horn*. After feeding for a few days, the larva *molts* or casts off the old skin, which act takes place four times before it reaches maturity. After the first molt, the future markings of the mature larva begin to appear and these become intensified after each molt. The caudal horn is wanting in a few species after the first molts, but its place is indicated by a tubercle.

The body of the mature larva is cylindrical, naked, usually smooth, but sometimes more or less granulated over the surface. In some species the segments following the head are divided into eight transverse wrinkles called *annulets*, and in some, the anterior segments of the body as well as the head are smaller and are retracted when at rest. There is great variation in the ground color of many species, and in some, a radical change occurs in this color just before they enter the ground for their final transformations.

After they have reached maturity and have done feeding, they descend to the ground and work their way down into the soil, where they construct or hollow out their cells in which they transform to pupæ. Some, however, transform on the surface of the ground in imperfect cocoons composed of leaves drawn together with silk. These pupæ are dark brown and cylindrical, except the posterior part, which tapers to the end and terminates in a short, stout, blunt spine called the *cremaster*. The covers to the wings, legs and other parts are distinct, and the cover to the proboscis or tongue-case is sunken nearly level with the surface of the body in some cases, while in others it stands off from the body, touching it only at the end and resembles a jug handle. The pupæ remain in the ground till the following summer, and sometimes till the second summer, before the moths emerge.

The moths comprised in this family are from medium to large size, with stout bodies, comparatively long and narrow fore wings and much smaller hind ones. The head is well developed and clothed with hair-like scales which are generally appressed, though in some species they form a tuft or ridge along the top of the head between the antennæ. The eyes are large, hemispherical and naked, with the scales overhanging in the form of lashes between the base of the antennæ and the front, in some species, but others are without lashes. The ocelli are absent in all the species; the palpi are densely clothed, comparatively short and curved upwards, the second joint usually being the longest and more or less swollen. The third joint is very short in most of the species, and sometimes sunken more or less into the outer end of the second. The proboscis is short and rudimentary in one group, but long in the others, as long or even longer than the body, and when not in use it is coiled up like a watch spring between the palpi. The antennæ are fusiform in some of the species, or largest near the outer end in others, and the tip is bent more or less into a hook or ends in a ciliated seta. The antennæ of the female are very finely ciliated on the under side, and a cross section is nearly circular; while the males have a high ridge along the under side of the antennæ, and are strongly ciliated or pectinated on each side of this ridge.

The thorax is well developed in all the species, and has the scales appressed over the surface, or there is a short, stout, erect tuft from each side of the metathorax, while some species have a central ridge of scales along the middle. The abdomen is stout and tapering to the apex, and there are fine spines along the edge of the segments in some of the species, which are concealed by the scales. Some species have anal tufts more or less fan-like, and small tufts along each side. The female ovipositor consists of two short pieces, one on each side, rounded at the outer end and clothed with short hairs. The external organs of generation in the male are quite complex, and besides the intromittent organ, consist of a clasper on each side, and a central plate above, to which is attached a hook curving downward, and beneath this is a projection which is generally shorter than the hook and curves up somewhat at the end. These two may be represented by the thumb and finger separated from each other by a little space and slightly bent. They vary much in form and in their relative length in different species. The side pieces or claspers also vary much in form and size, and often have a variously shaped spine, hook or clasping organ connected with the lower and inner side. These appear to be only a modification of one part of the side piece and not a distinct body.

The legs are well developed and of moderate and nearly equal length. The fore tibiæ have a stout spur called the *tibial epiphysis* on the inside, and in some species there are more or less spines over their surface. The middle tibiæ have a pair of unequal spurs at the outer end, and are also spinose in some species. The hind tibiæ are rarely spinose but have a pair of spurs at the end, and in most species, a second pair near the middle. The tarsi of all the legs are five jointed, spinose, and are armed with a pair of simple claws at the end.

The fore wings are generally long and narrow with an oblique and entire outer margin in some, and a sinuous, scalloped or angulated margin in others. They have either eleven or twelve veins, according to whether number 10 is present or wanting. Vein 1 is forked at the base, and ends at the anal angle; vein 2 arises from near the middle of the median vein; 3, from the outer fourth, and 4, from the end of the median which extends only to about the middle of the wing. The cross vein which joins the outer ends of the subcostal and median, is more or less oblique and often bent inward near the middle, from which point vein 5 arises. Veins 6 and 7 arise from one point or from a common stem which is a prolongation of the subcostal, and 8 arises from 7, a little before the middle, and ends at or near the apex of the wing. Vein 9 arises from the subcostal a little before the end of the cell and ends in the costa a little before the apex. At its outer fourth it sometimes gives off vein 10 from its upper side. This vein lies so close to 9 that it is not easily detected, but its presence or absence does not seem to be a constant character, for in some examples it is present in one wing but absent in the other. It is very doubtful, therefore, if it will prove of any assistance in classification. Vein 11 arises from the subcostal vein a little before the base of 9, and vein 12—the costal vein—arises from the base of the wing and ends near the outer fourth of the costa. The costa itself is thickened so as to appear like a vein, and veins 9 to 12, together with the subcostal, are crowded near the costal margin, thus making this part of the wing very strong.

The hind wings are much shorter than the fore wings, and have their outer margin entire or more or less denticulate. Most of the species have the margin produced into a more or less prominent angle at the end of vein 1 b. There are five veins arising from the base of the wing; the one nearest the costa is called the costal vein and ends in the costa near the apex; the next behind this is called the subcostal and is connected with the costal, by a short, oblique intercostal vein. The third vein, arising from the base of the wing, is called the median, and reaches scarcely to the middle of the wing, where it meets the cross vein extending back from the end of the short subcostal. The two remaining basal veins are numbered 1 a, and 1 b, the former being the one nearest the anal angle of the wing. Vein 2 arises from near the middle of the median, 3 from the outer fourth, and 4 from the end of the median. Vein 5 arises from near the middle of the cross vein, and 6 and 7 arise from one point or from a stem at the end of the subcostal. A *frenulum* is attached to the basal part of the costa of the hind wings, and passes through a membranous loop on the under side of the fore wings. This frenulum consists of a single curved bristle in the males, but of a cluster of six very short fine bristles in the females, and the loop is wanting in this sex.

SYNOPTICAL TABLE OF THE SPHINGIDÆ.

1	Tongue long and horny	2
	Tongue short and membranous...... SMERINTHINÆ	16
2	Abdomen with a well-developed anal tuft; flight usually diurnal...... MACROGLOSSINÆ	4
	Abdomen untufted; flight crepuscular or nocturnal	3
3	Thorax tufted; outer margin of the wings obliquely rounded...... SPHINGINÆ	7
	Thorax untufted; outer margin of the wings more or less excavate...... CHAEROCAMPINÆ	12
4	The middle of the wings transparent .... HEMARIS.	
	The middle of the wings opaque	5
5	Outer margin of the fore wings entire.... LEPISESIA.	
	Outer margin of the fore wings angulated	6
6	Fore tibiæ spinose...... AMPHION.	
	Fore tibiæ not spinose...... THYREUS.	
7	Eyes strongly ciliated	8
	Eyes scarcely or not ciliated	10
8	Fore tibiæ spinose	9
	Fore tibiæ not spinose...... DOLBA.	
9	First joint of fore tarsi with a row of three or four stout curved spines on the outside.... HYLOICUS.	
	First joint of fore tarsi without stout curved spines on the outside...... SPHINX.	
10	Head prominent; eyes large; palpi well developed, PHLEGETHONTIUS.	
	Head sunken into the thorax; eyes small; palpi short	11
11	Outer margin of fore wings excavate on vein 2, CERATOMIA.	
	Outer margin of fore wings entire, rounded, DAREMMA.	
12	Outer margin of fore wings angulated .. DEIDAMIA.	
	Outer margin of fore wings entire or sinuous	13

13 { Antennæ straight; largest near the outer end, DEILEPHILA.
Antennæ largest in the middle; hooked at the outer end 14

14 { Spurs of the middle and hind tibiæ short; legs weak, 15
Spurs of the middle and hind tibiæ long; legs stout, PHILAMPELUS.

15 { Scales of the head lying smooth and flat, CHAEROCAMPA.
Scales of the head in a ridge or tuft between the antennæ .... EVERYX.

16 { Outer margin of the fore wings evenly rounded and entire .... ELLEMA.
Outer margin of the fore wings scalloped or more or less angulated 17

17 { Fore tibiæ with a stout spine at the tip; large species, TRIPTOGON.
All the tibiæ spinose; medium sized species, CRESSONIA.
Tibiæ not spinose; medium sized species; hind wings with an eye-spot 18

18 { Outer margin of the fore wings scalloped, PAONIAS.
Outer margin of the fore wings more or less angulated, SMERINTHUS.

SYNOPSIS OF THE LARVÆ.

The following table may be of some assistance in determining the full grown larvæ, but it must be understood that there is so much variation in this stage that, until our knowledge of the larvæ is more complete, no entirely satisfactory synopsis of them can be given.

1 { Larva without a caudal horn........................ 2
Larva with a caudal horn.......................... 7

2 { Green, with three longitudinal white stripes on each side 3
Not marked as above.......................... 4

3 { Dorsal stripe spotted with red......*E. harrisii.*
Dorsal stripe not spotted with red, *E. coniferarum.*

4 { With six light-colored oval spots in a row on each side 5
Without oval spots on the sides........*T. abbotii.*

5 { Body green.......................*P. pandorus.*
Body pale straw to reddish brown 6

6 { Three inches or more long...........*P. achemon.*
Less than three inches long..............*P. vitis.*

7 { Without seven oblique stripes on each side.......... 8
With seven oblique stripes on each side 14

8 { Larva without stripes or spots........*D. inscripta.*
Larva with stripes or spots.............. 9

9 { Light green, with a large crimson eye-spot on the side of the 4th segment ....*C. tersa.*
Without these characters..........................10

10 { Chocolate brown, with amber stripes along the sides, *A. nessus.*
Ground color green 11

11 { Body with even longitudinal stripes................12
Body with longitudinal stripes composed of more or less confluent spots................... 13

12 { Dorsal line, a brownish shade..........*H. diffinis.*
Dorsal line, pink, bordered with white ..*H. thysbe.*

13 { Olive green, with a row of yellowish spots along the sides ....*D. chamaenerii.*
Yellowish green or black, with a row of confluent spots along the sides ....*D. lineata.*

14 { With four short thoracic horns........*C. amyntor.*
Without thoracic horns 15

15 { With a subdorsal longitudinal stripe 16
Without subdorsal longitudinal stripes 18

16 { With a dorsal row of red or lilac spots, *E. myron.*
Without a dorsal row of red spots.................17

17 Subdorsal line extending from the head to the caudal horn .... *E. versicolor.*
Subdorsal line not extending forward to the head, *E. chœrilus.*

18 Top of the head more or less angulated; body granulated.................................19
Top of the head rounded; body rarely granulated....23

19 Caudal horn nearly obliterated........*T. modesta.*
Caudal horn well developed 20

20 Sides of the body with one or two longitudinal rows of reddish brown spots 21
Sides of the body not spotted with reddish brown....22

21 Caudal horn green, tinged with yellow on the sides, *S. myops.*
Caudal horn light brown at base and tip, green in the middle .... *S. astylus.*

22 Caudal horn apple green and granulated, *C. juglandis.*
Caudal horn violet and granulated... *S. geminatus.*
Caudal horn bluish green .... *P. excæcatus.*

23 Black spots or marks on top of the thoracic segments..24
Without black marks on thoracic segments..........25

24 Caudal horn nearly obliterated........ *S. eremitus.*
Caudal horn of usual size .... *P. cingulata.*

25 Oblique stripes, white or yellow margined above with crimson .... *D. hylaeus.*
Oblique stripes, white and margined above with violet, *S. gordius.*
Oblique stripes, white and margined above with purple or mauve.................... *S. drupiferarum.*
Oblique stripes, white and margined above with dark blue .... *S. kalmiæ.*
Oblique stripes, white or yellow and margined above with black......................... *H. plebeius.*
Oblique stripes not colored as above...............26

26 Last segment dotted with black...... *D. undulosa.*
Last segment not dotted with black................27

27 Caudal horn reddish, tipped with black .. *P. celeus.*
Caudal horn bluish, tipped with black, *P. carolina.*

Family—SPHINGIDÆ.

Sub-Family—Macroglossinæ.

Genus I, HEMARIS, Dalman, Vet. Akad. Handl. p. 207
He-ma'-ris. (1816).

Head small but not sunken into the thorax, without a ridge or tuft of scales on the top; proboscis horny and nearly as long as the body; palpi closely scaled and forming a more or less complete cone in front of the head; eyes of medium size and lashed; antennæ not more than two-thirds as long as the costa, clavate or swollen near the outer end and terminating in a minute and bent seta, biciliate in the males but simple in the females; thorax smooth, tapering in front and prolonged in front of the fore wings; abdomen well developed, somewhat flattened beneath, with a broad fan-like anal tuft. The posterior edge of the segments above is armed with minute flattened spinules.

The fore wings have eleven veins, an entire and rounded outer margin, and the middle of the wings is transparent and crossed by the dark veins. The hind wings are also transparent in the middle, and the outer margin is somewhat excavated between veins 1b and 2.

The species of this genus fly around flowers during the middle of the day in the hot sunshine. The larvæ undergo their transformations in an imperfect cocoon on the surface of the ground.

Four species occur in New England and may be separated by the following table:

1 { Discal cell of the fore wings crossed by a longitudinal bar of scales resembling a vein.......*H. thysbe.*
Discal cell of the fore wings not crossed by a longitudinal bar of scales............................ 2

2 { Transparent part of the hind wing crossed by five veins .... *H. gracilis.*
Transparent part of the hind wing crossed by six veins .... 3 }

3 { Apex of fore wings with a rust red spot. . *H. diffinis.*
Apex of fore wings without any rust red spot, *H. tenuis.* }

1. Hemaris tenuis, Grote.

He-ma'-ris ten'-u-is.

"Expanse of wings, one inch and a half.

Pale yellowish and black. The two bluish white lateral abdominal spots evident against the blackish hairs of the basal segments, which latter are dorsally yellow. Anal tuft black, divided by yellow central hairs. Beneath, some sparse yellow hair overlies the usual black abdominal vestiture. Legs black; pectus pale yellowish white; palpi above black, beneath pale yellowish.

Wings largely vitreous, with very narrow, dull blackish borders; blackest at base, as usual, and partially overlaid with yellowish scales. Costal edging narrow; the band along external margin is even on its inner edge and narrower throughout than in any species hitherto described from the Atlantic District. There is no perceptible red apical shading. The body squamation is rather rough, and in size it is the smallest of our species yet described. The external margins of the wings are more rounded and full than in any of our other known species of Hemaris."

This species occurs in New York and is reported from Maine, but as it is unknown to me I give the original description. The early stages and food plants are unknown.

2. Hemaris diffinis, Boisduval.

He-ma'-ris dif-fi'-nis.

Expanse of wings, one inch and three-fourths.

The fore wings are transparent, with dark brown veins, and have a narrow, dark brownish opaque border along the costa, a similar one on the outer margin, which is wider at the apex, where there is a rust-colored spot on it; and there is also a brown patch on the base of the wing with a narrow prolongation along the hinder border.

The hind wings are transparent, with dark brown veins, a narrow outer border and a broad inner one which extends around on the costa, where it grows narrower as it extends outward. These borders are dark brown and opaque, and marked more or less with rust color.

Head above, and front part of the thorax, olive green inclining to yellowish on the sides. A broad band of brown, bordered on each side with pale yellow, extends along the top of the thorax and abdomen. Upper side of palpi, legs and under side of thorax and abdomen, black, marked with pale yellow on the under side of the palpi; sides of the thorax beneath the wings, front of the fore coxæ, a few hairs on the fore femora and on the middle and hind tibiæ, also on the sides of the middle segments of the abdomen. The lateral tufts at the end of the abdomen are black, while the central one is pale brown. There are a few blue scales on the hinder edge of the sides of the first two abdominal segments.

The mature larva is one inch and three-fifths in length, slightly tapering towards each end. The head is oval, of an apple green color and sprinkled with minute whitish granulations. The body appears to vary in color from blue to green and greyish pink above, green to yellowish brown on the sides, deepening into reddish brown on the under side. The upper surface is thickly granulated in transverse lines, of a yellowish color on the second segment, but white elsewhere. A brownish shade extends along the middle of the back on each side of which, half way down to the spiracles, there is a pale yellow line extending from the second segment to the base of the caudal horn which is of a reddish color and acutely granulated. The caudal horn is sometimes said to be black.

This larva feeds on the leaves of Bush Honeysuckle (*Diervilla trifida*), Snowberry (*Symphoricarpus racemosus*), and Fever-wort (*Triosteum perfoliatum*).

3. Hemaris gracilis, Grote and Robinson.

He-ma'-ris grac'-i-lis.

Expanse of wings, one and three-fourths inches. All the wings are transparent and crossed by the dark brown veins, but with an opaque border all around, of a dark reddish brown above and lighter beneath. A broad pale yellow band extends from the anal angle on the under side of the hind wings, to the transparent part. Six veins cross the transparent part of the fore wings and five cross that of the hind wings.

The upper side of the head, thorax and first two segments of the abdomen are olive green. The remaining segments are dark reddish brown, with olive green on the sides of the last two segments. The anal tuft is reddish brown in the middle and black on the sides. The under side of the head and thorax are cream yellow, with a stripe extending backwards from the eyes, all the legs and the under side of the abdomen, reddish brown. There are four small tufts of cream-colored hairs along each side of the abdomen beneath and a row along the middle.

This rare species has been taken occasionally in Maine in the early part of June, flying around flowers, like *H. diffinis*, but the food plant and early stages are as yet unknown.

4. Hemaris thysbe, Fabricius.

He-ma'-ris thys'-be.

Expanse of wings, two inches. All the wings are transparent and crossed by the dark brown veins. The fore wings have a narrow costal border, a wide outer border dentate inwardly on the interspaces, and a basal patch extending along the hinder margin, of a dark reddish brown color, and overlaid on the basal portion with olive green hairs. The cell is divided through the middle by a line of brown scales which appear like an inward prolongation of vein 5. The hind wings are bordered all around, narrowly on the costa, more widely on the outer margin, with dark reddish brown, while the hinder margin and base of the wing have a very wide border of rust red. All these borders are of a lighter color on the under side of the wings.

The upper side of the head, palpi and thorax is of a bright olive green color. The sides of the palpi are blackish and they are cream colored beneath. The breast and legs, except the hind tarsi and lower ends of the tibiæ which are brown, are also cream colored. The upper side of the abdomen has the first two segments yellowish brown, the next two, deep reddish brown and the terminal segments yellowish brown with reddish brown patches in the middle. The anal tuft is reddish brown in the middle and black on the sides.

Variety *uniformis*, G. and R. differs in not having the inner edge of the outer border dentate on the interspaces. This variety is common at Orono.

The mature larva is nearly one inch and three-fourths in length, tapering towards the head, which is dull green and granulated. The body is clear green, lighter above and shading darker below. The under side is of a dull rose red color from the third pair of legs to the end of the body, and this color is bordered on each side with a buff stripe. A pinkish stripe extends along the middle of the back, bordered on each side with a whitish line which ends in front of the caudal horn. A white or yellowish line runs along each side from the second segment to the base of the caudal horn, which is curved, light blue, tipped with yellow, granulated with white on the sides and black in front.

The pupa is about one inch long, of a blackish brown color, with the entire surface shagreened. The terminal spine is broad at the base, prominent, flat, rounded at the tip and armed with about ten very fine hooks and a central stouter double hook by which the pupa is attached to some threads of silk in its cocoon.

The larva of this species feeds on Snow-ball (*Viburnum opulus*), Arrow-wood (*Viburnum dentatum*), Sheep-berry (*Viburnum lentago*), Snow-berry (*Symphoricarpus racemosus*), and Hawthorn (*Cratægus*).

Genus II, AELLOPOS, Hübner, Verz. bek. Schm. p. 131 (1818).

5. Aellopos titan, Cramer.

A-el'-lo-pos ti'-tan.

This species, which is unknown to me, is said to occur rarely in the southern part of New England.

Expanse of wings, two inches and three-tenths. Dull blackish with a slight olivaceous tinge; discal spot black and scarcely visible; a straight, semi-transparent, whitish band crosses the middle of the fore wing, followed by another which is much narrower. A somewhat arcuated, similarly colored band formed of a double series of semi-vitreous, lunate spots extends from the costa nearly across the wing. The terminal space is paler and has purplish reflections. The under side is dark brownish, and the whitish markings of the upper side are distinctly reproduced.

The hind wings are blackish, paler at the base and shaded with yellowish along the costa. Head and thorax above, dull brownish with a slight olivaceous tinge. Abdomen olivaceous, with the third abdominal segment white above; fourth segment with a large dark brownish lateral shade which is much reduced on the fifth, but extends entirely across the sixth. Anal hairs, brown on the sides and olivaceous in the middle.

The early stages and food plant are apparently unknown.

Genus III, LEPISESIA, Grote, Proc. Am. Ent. Soc. V, p. 38 (1865).

Lep-i-se'-si-a.

Head somewhat sunken into the short and square thorax; proboscis horny and nearly as long as the body; palpi closely scaled, ascending; eyes of medium size and ciliated; antennæ not more than two-thirds as long as the costa, swollen near the outer end and terminating in a ciliated seta; thorax and abdomen smoothly scaled, the latter with an anal tuft. The legs are comparatively long and slender; the fore tibiæ are armed with stout spines; the middle tibiæ have one pair of long unequal spurs, the hind tibiæ have two pairs.

The fore wings have eleven veins, the costa is somewhat depressed in the middle, the outer margin is entire and rounded but with a slight excavation between veins 2 and 3. The outer margin of the hind wings is straight and entire. These insects fly around flowers in the hot sunshine.

6. Lepisesia flavofasciata, Barnston.

Lep-i-se'-si-a fla-vo-fas-ci-a'-ta.

Expanse of wings, one inch and three-fourths. Head and thorax above, pale yellow; palpi black, yellowish beneath; abdomen black, with the first segment above, and the side tufts on the last segment but one, pale yellow. Under side of the body and the legs, black.

Fore wings blackish, with a pale or whitish oblique band across the wing beyond the cell, and crossed by the black veins. Discal spot small and black. Hind wings black, with a broad central band of bright orange yellow. Under side of the wings marked as above, but paler, and the basal part of the fore wings is bright orange yellow.

The early stages and food plant of this exceedingly rare moth are unknown. It has been taken in Canada, Massachusetts, Belfast and Orono, Maine. Mr. Thaxter informs me that he saw one at Kittery, Maine, flying around the flowers of Larkspur in June. It flies in the middle of the day in the hot sunshine, around the flowers of apple, lilac, shad-bush (*Amelanchier canadensis*), etc. It appears to be one of our earliest day-flying sphinx moths.

Genus IV, AMPHION, Hübner, Verz. bek. Schm. p. 135 (1818).

Am-phi'-on.

Head rather small but not sunken into the thorax, the scales on the upper side turned towards the central line but scarcely forming a ridge; proboscis nearly as long as the body; palpi moderate, closely scaled, the scales forming a cone in front of the head; eyes provided with numerous long lashes above; antennæ fusiform, prominently hooked at the end; thorax well developed, the scales lying smooth over the surface, except at the posterior part, where they are inclined to turn up; abdomen with a broad fan-like anal tuft; segments provided with several series of scale-like spinules along the posterior edge of the segments above; fore tibiæ spinose on the outside near the lower end; middle tibiæ with one pair of medium-sized spurs, hind tibiæ with two pairs.

Fore wings with eleven veins, the outer margin excavate below the apex and above the anal angle; the hinder margin concave before the anal angle. Hind wings with the outer margin slightly dentate and somewhat produced at the end of vein 1 b.

7. Amphion nessus, Cramer.

Am-phi'-on nes'-sus.

Expanse of wings, from one inch and three-fourths to two inches.

The upper side of the head, thorax, abdomen and fore wings is of a dull dark rusty brown. The middle of the fore wings is crossed by a rich dark brown oblique band within which there are two lines of the same color, and beyond the central band is another line followed by several shade spots of the same color. These markings are not very clearly defined. The fringes are of the same color as the wings, except at the middle of the excavations, where they are pale yellow.

The hind wings are of a rich dark brown color, with an oblique, central reddish band which, starting from the costa, gradually changes its color and merges into the ground color of the wing, and is lost before reaching the hinder margin of the wing. The fringes are pale yellow, broken in places with brown. The hinder edge of the fourth and fifth segments and the base of the fifth, on the upper side of the abdomen, are of a bright sulphur yellow color. The under side of the head, body and wings is of a rust red color, shaded and marked more or less with brown. A pale yellow stripe extends from the base of the antennæ along the side under the wings.

The newly-hatched larva is cylindrical, except a slight enlargement of the third and fourth segments, increasing at each molt. Body pale yellow green, with two light, longitudinal, subdorsal lines, straight from the head to the eleventh segment, thence curving to the caudal horn which is short, black, ochreish or reddish brown at the base, tapering abruptly, and often carried in a line with the back. (Miss Sanders.)

The mature larva is from two and a half to three inches long, tapering from the fourth segment to the head. The color is of a uniform chocolate brown, thickly dotted with dark amber especially along the line of the back, and there are stripes along the sides, of the same color. (Andrews.)

Boisduval has described it from an excellent drawing by Abbot, as follows: "Of a yellowish green color, with a longitudinal band running along each side and ending at the base of the caudal horn, which is red and slightly rosy. Feeds on the Rubiaceæ and sometimes on vines" (*Ampelopsis quinquefolia*). It is said, by Dr. Jewett, to feed on *Epilobium coloratum*.

This species is very common in Maine and flies from the first to the middle of June, around flowers in the bright sunshine. It is also reported as being on the wing occasionally, early in the evening.

Genus V, THYREUS, Swainson, Zool. Ill. Vol. 1, p. 60, (1821).

Thy'-re-us

Head well developed, with the scales forming a low ridge between the antennæ; proboscis nearly as long as the body; the palpi densely scaled; eyes with numerous lashes; antennæ fusiform, the end bent into a long hook; thorax well developed, somewhat tufted on the hinder part; abdomen somewhat flattened beneath and provided with anal and lateral tufts, the segments without spinules along the hinder edge; tibiæ not spinose, the middle with one pair of very unequal spurs, the hind tibiæ with two pairs.

The fore wings have eleven veins and sometimes twelve. They are rather long and narrow, and are angulated on the outer margin. The hind wings are somewhat dentate on the outer margin, and produced on vein 1 b.

8. Thyreus abbotii, Swainson.

Thy'-re-us ab-bot'-i-i.

Plate IV, Fig. 4.

Expanse of wings, about two and a half inches.

Head, palpi and thorax, dull chocolate brown. The hinder edge of the collar is blackish, and there are two parallel lines of the same color on each side, starting from near the middle of the thorax and extending obliquely down and back along the edge of the patagiæ. The abdomen is dark chocolate brown, lighter across the middle and with blackish bands across the basal and outer segments. The anal brush is dull yellowish brown, with the central part lighter.

The fore wings are dull chocolate brown, lighter beyond the middle, even yellowish brown in the female. There is a series of four or five dark, strongly toothed lines crossing the outer part of the wing, beyond which it is colored like the base and has several dark brown marks on it. The basal part of the wing is separated from the lighter portion beyond by a heavy dark brown line which, starting from the basal third of the hinder margin, extends obliquely up and out, gradually growing finer till it is lost just within the small, dark discal dot. The outer margin of the wing has five rounded excavations of unequal size and depth.

The hind wings are lemon yellow, with a dark brown terminal band which is broken into a series of short lines above the anal angle. The under side of the insect is much lighter than above.

The newly-hatched larva is cylindrical, of a uniform light bluish green with a powdery bloom, and the body is finely striated transversely. The caudal horn is long and very slender, erect, of a blackish color and yellow at the base.

The mature larva (Plate IV, Fig. 4) is a little over two inches in length, and has no caudal horn, but its place is taken by a polished, black tubercle with a yellow ring around it. The larva varies in color from dull yellow to reddish brown, each segment being marked transversely with six or seven fine black lines, and longitudinally with dark brown patches, but these markings are subject to great variation.

This species has not been taken in Orono but occurs rarely at Kittery, Maine, and is common in Massachusetts and has a wide distribution through the United States.

Sub-Family—SPHINGINÆ.

Genus VI, CERATOMIA, Harris, Sill. Jour. Vol. XXXVI.
Cer-a-to'-mi-a. p. 293 (1839).

Head small and somewhat depressed, the scales forming an ill-defined tuft between the antennæ; proboscis reaching nearly to the end of the thorax; palpi short, slender and slightly ascending; eyes small, scarcely lashed; antennæ fusiform and ending in a small ciliated hook; thorax short and but little advanced beyond the base of the fore wings, with short, stout post-thoracic tufts and scale ridges along the inner edge of the patagiæ; abdomen cylindrical and tapering to the end without anal or side tufts, the segments armed with round spinules on the hinder edge; tibiæ not spinose, middle tibiæ with one pair of long spurs, hind tibiæ with two pairs; first joint of fore tarsi with a row of three stout, curved spines on the outside.

Fore wings ample, usually with twelve veins (sometimes with eleven), outer margin oblique, nearly entire but slightly excavate at the end of vein 2. The outer margin of the hind wings is entire except a slight rounding out on the end of vein 1 b.

Pupa smooth, tongue-case not apparent, transformations subterranean.

9. Ceratomia amyntor, Hübner.

Cer-a-to'-mi-a a-myn'-tor.

Expanse of wings, three and three-fourths inches.

Palpi, under side of the head and all the legs dark coffee brown. Upper side of the head, collar and sides of the thorax, whitish, the head and collar stained on top, more or less, with clay color and edged with brown. Upper side of the thorax clay color, with the patagiæ edged with dark brown, and another line of dark brown follows the upper edge of the white on the sides. The lateral thoracic tufts at the posterior part of the thorax are marked with clay color, dark brown and white. The abdomen above and beneath is clay colored, with a dorsal line and two lateral stripes on each side, of dark brown.

The costa of the fore wings is light brownish gray, and a stripe of clay color extends from the base of the wing along the cell, widening outwardly to the apex. The central part of the wing below the cell, and between the inner and outer cross lines, is dark coffee brown. The discal spot is small and white, and there are several heavy black dashes between the veins and parallel with them, below the median and beyond the cell. A triple dark brown line starts from the costa near the base and runs very obliquely towards the end of the cell, giving off one tooth in its course, then turning sharply back, runs to the hinder margin near the base of the wing in a somewhat wavy course. A similar triple line more separated on the costa, starts from the outer fourth and runs down as far as vein 5, at nearly right angles with the costa, thence obliquely and parallel to the hinder margin. This line is several times angulated in the first part of its course, then wavy to near the hinder margin, where it forms a sharp outward angle. The portion of this line which is parallel with the outer margin is bordered on the outside with a gray shade.

Hind wings clay colored, shaded with brown in the form of a central and a subterminal ill-defined brown band. All the fringes above and beneath are brown, cut by ochre yellow between the veins. Under side of all the wings, pale brownish gray, lighter on the costal margins. The outer cross lines of the fore wings are reproduced, and there are three brown lines crossing the middle of the hind wings, which give out sharp angles on the veins.

The eggs of this moth are of an oblate spheroidal form, the lateral diameter being about one-twentieth of an inch, and the vertical diameter somewhat less. They are pale green with very fine granulations over the surface, and hatch in from seven to ten days, leaving the shells colorless and transparent.

A newly hatched larva is about one-fifth of an inch long, pale green, with a straight caudal horn about half the length of the body, dotted and tipped with brown. There is a pair of minute thoracic horns on the top of the third segment and another pair on the top of the fourth, and there is a row of minute fleshy teeth along the middle of the back, which are scarcely visible. Before the first molt the larva has nearly doubled its size and has a white vascular line, a faint line on each side of the middle of the back and seven oblique stripes on each side of the body, all of the same color. The head is smooth and the thoracic horns are barely visible.

They molt their skins in about five days after they hatch, after which the head and caudal horn are granulated, the thoracic horns prominent, the fleshy teeth along the middle of the back with the stripe on each side of it, the oblique stripes on the sides and the thoracic lines are plainly visible.

The second molt is made in from five to eight days after the first, when the row of teeth along the middle of the back is prominent, the lateral oblique stripes are granulated and the caudal horn is pale yellow with granulations in front and behind. The third molt is made in from six to eight days after the second, when the larva is light green with the teeth along the back and the granulations on the side, of a whitish color. The caudal horn is now curved, of a yellowish green color, and covered with brown granulations on the forward side. The thoracic horns are tipped with yellowish.

The fourth and last molt is made in from six to eight days, and in six days more they reach maturity, leave their food plant, descend to the ground which they enter for the purpose of spending the winter and passing their final transformations. The mature larva is from two and three-fourths to three and one-fourth inches long, pale green or reddish brown, head and body strongly granulated, a dorsal row of fleshy teeth, one on each wrinkle, tipped with whitish or pink, extends from the fourth segment to the caudal horn. There is a pair of short, straight, tuberculated horns on the top of the third segment and a similar pair on the fourth. A line of granulations connects the thoracic horns. Seven oblique stripes of whitish granulations occur on each side, each of which crosses one segment and a part of the one before and the one following. The last stripe extends to the caudal horn.

This species feeds on the leaves of the Elm, Bass-wood and *Betula alba*.

Genus VII, DAREMMA, Walker, Lep. Het. Part. 8. p. 230 *Da-rem'-ma.* (1856).

Head, small and sunken into the thorax, with a slight tuft on top; proboscis not longer than the thorax; palpi short and small; eyes small and without lashes; antennæ fusiform, ending in a small ciliated hook; thorax short and but little advanced beyond the base of the fore wings, with short, stout post-thoracic tufts and scale ridges along the middle and inner edge of the patagiæ; abdomen cylindrical and tapering to the end without anal or side tufts; the segments armed with round spinules on the hinder edge; tibiæ not spinose; middle tibiæ with one pair of long spurs, hind tibiæ with two pairs; first joint of the fore tarsi with a row of three stout curved spines on the outside.

The fore wings have twelve veins (sometimes eleven), and the outer border is oblique, rounded and entire. The outer margin of the hind wings is nearly entire.

10. DAREMMA UNDULOSA, Walker.

Da-rem'-ma un-du-lo'-sa.

Expanse of wings, three and one-half inches.

Head and palpi, brownish gray, the latter being darker on the middle joint, and the head darker above and lighter on the sides. The thorax is gray with two black lines edged with yellowish, crossing the prothorax. These lines meet two similar ones on each side, which run backwards, one on each edge of the patagiæ and meeting behind where the patagia is tipped with white. There is also a curved black line preceded by white and followed by yellowish across the hinder part of the thorax. The abdomen is gray with a dark brown line along the middle and two stripes of the same color on each side, and the segments are edged with yellowish scales. The whole under side is gray with the breast of a pale coffee brown color.

The fore wings are gray, mixed with yellowish scales and crossed by four pairs of wavy or angulated dark brown lines more or less distinct, which start from the costa at about equal distances apart, and divide it into five nearly equal parts. The pair nearest the base of the costa, runs obliquely as far as the cell, giving off one tooth, then it takes a somewhat wavy course to the hinder margin nearly at right angles with it. The second pair is distinct on the costa but crosses the wing a little within the discal spot, as a dark brown shade. The third pair starts at right angles with the costa, and curving around the end of the cell, ends near the middle of the hinder margin. The inner of these two lines is slightly angulated while the outer one gives off quite long and sharp teeth, and the space between them is filled in somewhat with ochre yellow scales. Between this and the outer pair of lines the space is filled in somewhat with whitish. The outer pair of lines starts at right angles with the costa, curves evenly around to vein 2, and then runs straight to the hinder margin. The outer one of this pair is the darkest and most prominent of all, and is neither undulated nor toothed, while the inner one gives off acute angles on each vein. A black shade line starting from the apex obliquely, extends in to the third pair of cross lines. A parallel dash crosses the outer pair just below, and there are two parallel black dashes near the middle of the wing extending from the median vein out to the outer pair of lines between the veins. The fringes are white, marked on the veins with dark brown spots from which brown dashes extend nearly half way across the terminal space.

The hind wings are dark smoky brown, lighter on the hinder margin, and crossed by three parallel darker brown wavy lines. The fringes are white and marked with brown on the veins. The under side of the wings is gray. The fore wing is crossed on the outer part by a dentate line, and the oblique apical line is partly reproduced. The hind wings which are somewhat lighter, are crossed by two dentate yellowish brown lines, one a little before the middle, the other a little beyond.

The eggs are pale green or aqua marine in color, spheroidal in form, the vertical diameter is four-fifths of a millimeter, one lateral diameter is two millimeters and the other is one and two-fifths millimeters. The surface is very finely granulated and has pearly reflections. The eggs hatch in eight days.

The young larva is one-fifth of an inch long, of a very pale greenish yellow color with fine hairs scattered over the surface. The caudal horn is large, straight and pointed obliquely up and back at an angle of 45 degrees with the line of the body, and is covered with a fine pubescence. It is smoky brown at the tip only, but before the first molt the brown extends nearly over the whole surface of the horn.

The first molt occurs in from four to six days, after which the larva is one-third of an inch long, of a pale green color, the head being a little lighter than the body, and having the surface granulated and a pale vertical stripe on each side.

There are seven oblique stripes on each side of the body, and a longitudinal stripe of a whitish color but not plainly visible.

The second molt is made in from three to five days, after which the larva is three-fifths of an inch long, of a pale green color and with the stripes as before the molt but plainer, and there is added a series of reddish spots on the forward side of the oblique stripes where they cross the longitudinal stripe. The caudal horn is of a pale watery pink color and covered with short, blunt spines, from which arise short fine hairs. The surface of the body is somewhat granulated, especially on the forward segments and behind the caudal horn.

The third molt is made in from four to six days, after which the larva is about one inch long, of a light green color, rather lighter than the under side of the lilac leaf on which it feeds. There is some variation of the ground color at this stage; some are yellowish green while others incline to a bluish green. The longitudinal stripes are now obliterated and the oblique stripes are as in the preceding molt. The legs and caudal horn are pink or pale vinous red, the latter beset with short, stout spines as before. The head and three following segments have whitish granulations above, while the last segment has black granulations on the upper side. The head has a broad vertical stripe of a dull whitish color on each side. The spiracles are pale pink with a white dot at each extremity.

The fourth and last molt is made in from seven to ten days, after which the larva is about one inch and three-fourths in length and of the same color as in the preceding molt. The stripes on the side of the face, the caudal horn and the legs are pale pink or flesh color. The last segment is sprinkled with black granulations on the upper side, and the spiracles are bright vermillion with a vertical white slit in the middle. The oblique stripes are greenish white. The larva reaches maturity in from eight to twelve days from the fourth molt, and is nearly three inches long. It now changes to a dull brownish color which somewhat obscures the markings, when it descends to the ground and working its way down into the soil, transforms into a dark brown pupa one inch and three-fourths long, with the tongue-case sunken to a level with the surface.

This species feeds on the leaves of the White and Black Ash, Lilac and Privet (*Ligustrum vulgare*).

Rev. G. D. Hulst has written me that *Diludia jasminearum*, B. & Le C. has been taken on Long Island, but as I do not know the species I have not included it in this paper, though it may occur in southern New England.

Genus VIII, PHLEGETHONTIUS, Hübner, Verz. bek. Schm. p. 140 (1818).

Phleg-e-thon'-ti-us.

Head prominent, untufted; proboscis longer than the body; palpi long, ascending and pressed against the front. The basal joint is unusually long, the third joint minute, and the scaling of the second joint gives the palpi the appearance of being enlarged at the outer end; eyes large and scarcely lashed; antennæ fusiform and ending in a short ciliated seta; thorax stout and much advanced beyond the base of the fore wings, with short, stout erect post-thoracic tufts; abdomen cylindrical, tapering to a point, without anal or side tufts, the posterior edge of the segments armed with round spinules; tibiæ not spinose (*celeus* has a few near the end of the fore tibiæ), the middle tibiæ with one pair of long spurs, the hind tibiæ with two pairs. The first joint of the fore tarsi has a row of three or four stout curved spines on the outside.

The fore wings are ample and have eleven veins, an oblique, rounded and entire outer margin. The outer margin of the hind wings is slightly scalloped and produced on vein 1 b.

The species of *Phlegethontius* occuring in New England may be separated by the following table:

1 { Abdomen with rose red spots along the sides, *P. cingulata*.
  { Abdomen with yellow spots along the sides 2

2 { Fore wings pale gray with brownish lines, *P. celeus.*
Fore wings dark brownish gray with darker lines, *P carolina.*

11. Phlegethontius carolina, Linneus.

Phleg-e-thon'-ti-us car-o-li'-na.

THE TOBACCO WORM.

Expanse of wings, from four to five inches.

Upper side of the head, thorax, abdomen, and fore wings, dark brownish gray. Palpi a little lighter beneath and in front. Thorax with a few short black dashes on the forward part, and there are also some irregular black spots edged with white on the posterior part. The abdomen has five bright orange colored quadrate spots along each side, decreasing in size towards the apex and surrounded with black. There is a trace of a black line along the middle, and the segments are partly edged with white.

The fore wings have a small white spot at the base, and a small whitish triangular discal spot edged with dark brown. There are nine more or less evident wavy or angulated dark brown lines crossing the wing, four of which are inside of the discal spot at nearly equal distances apart, and so arranged as to give the basal field a long acute outward angle on the cell; three more cross the wing a little beyond the cell giving off acute angles on the veins, and fusing together below the discal spot, and forming a more or less evident dark brown patch. The space following these three lines inclines to wood brown in color. Two more wavy or angulated lines cross the wing, the inner one being dark brown or black and heaviest towards the hinder margin, the outer one which is whitish, crosses the wing just within the outer margin but is obsolete towards the apex. A dark brown line, shaded above with lighter gray than the ground color of the wing, extends somewhat irregularly obliquely in and down from the apex and across the wood brown space. Fringes dark brownish gray, cut with white between the veins.

The hind wings are gray with a small, dark smoky brown spot at the base, a line extending nearly across the wing outside of the spot, two more across the middle, all of the same color as the basal spot, while the marginal band, widest at the apex, is dark brownish gray edged on its inner side with smoky brown and shaded with brown through the middle. The under side of the fore wings is of a uniform dark gray, and crossed by two parallel lines a little beyond the cell, which give off angles on the veins, while the wing beyond is somewhat clouded. The under side of the hind wings is of a lighter gray than the fore wings, and they are crossed, near the middle, by three lines which form acute angles on the veins. A shade band crosses the wing beyond this, and the anal portion is whitish. The under side of the body and abdomen is gray, and there are three or four black spots in a row along the middle of the under side of the abdomen. The legs are somewhat darker, and the middle and hind tarsi are tipped with whitish.

The larva when first hatched is of a greenish color with a faint dusky streak along the back, and the head and last two segments of the body are covered with short sparse hairs, and the caudal horn is finely serrated. After the first molt, the body is green with its dorsal line as before, but the whole surface of the head and body is granulated. The caudal horn is thorny, and there are only a few hairs which are confined to the head and last segment. After the second molt the body is about an inch long, green and without hairs except a few on the last segment which are directed backwards. The spiracles are black with a faint purplish tinge surrounding them. The body now has the markings of the full grown larva. After the third molt, the body is about one inch and one-fourth in length; the head loses its rough points and becomes obscurely shagreened; the spiracles are pale straw color surrounded by a ring of jet black, and this again by purplish which is distinctly edged with black.

The full grown larva is green (of varying shades), with seven oblique white stripes bordered above with bluish or dark brown, on each side; the first begins on the front edge of the fifth segment on a line with the spiracles, and passing obliquely up and back, crosses this segment and the greater part of the sixth. The second stripe begins at the same place on the sixth segment and crosses this and the greater part of the next, and so on with the rest, the seventh and last ending at the base of the caudal horn. The last segment is edged with white, and there are minute circular white dots edged with purplish brown, each with a minute hair, scattered over the upper surface of the body, especially on the anterior segments. The caudal horn, somewhat curved backward, is reddish or bluish and white on the sides, and studded with short black spines, or the whole horn is sometimes black. At maturity the larva descends into the ground where it transforms into a dark reddish brown pupa with a detached cylindrical tongue-case bent like a jug handle, but not so much arched nor so long as that of *P. celeus*. It is somewhat swollen or bulbous at the end where it is applied to the body not quite half way to the end of the wing cases.

They feed on the leaves of the Tomato and Tobacco plants, and at times do a great deal of damage. They also feed on Jamestown weed (*Datura stramonium.*)

12. Phlegethontius celeus, Hübner.

Phleg-e-thon'-ti-us ce'-le-us.

THE POTATO-WORM OR TOMATO-WORM.

Expanse of wings, from four to five inches.

The whole surface of the body and wings above and beneath is ashy gray. The top of the thorax is tinged with brownish and has several short transverse black lines on the prothorax, one along the edge of the patagiæ and another through the middle of it, of the same color. The metathoracic tufts are bluish, and followed by a large black patch which extends across the whole width of the thorax, and this is followed by a whitish stripe. The abdomen has a fine black line along the middle, a row of fine orange colored spots surrounded with black along each side, and the segments above and below these spots are edged with white. A row of four or five black spots runs along the middle of the abdomen beneath.

The fore wings are somewhat shaded with brown beyond the middle and near the apex, and crossed by three or four parallel brown lines which extend from the basal third of the costa out to the small obscure discal spot, then across the wing to the hinder margin near the base. Three nearly parallel, much angulated, brown lines start from the outer fourth of the costa and cross the wing to the middle of the hinder margin. A less angulated and stronger dark brown line starts from the costa a little beyond the last and crosses the wing, ending a little inside of the anal angle. A subterminal brown line edged with whitish on the inside, runs near and parallel to the outer margin, but does not reach either the costa or the hinder margin. There is a slightly curved, black, double line between the veins outside of the discal spot, above the outer part of which is another, curved up at its outer end, and nearly reaching the inner end of one extending obliquely inward from the apex. Fringes brownish, marked between the veins with sordid white.

The hind wings are pale gray, bordered exteriorly with ashy gray, on the inside of which there is a dark brown band widest towards the costa. The middle of the wing is crossed by a pair of dark brown lines dentate on the veins, and within these there is a curved line of the same color, and a small spot resting on the base of the wing. Fringes, brownish marked between the veins with whitish. A brown line crosses the outer fourth of the under side of the fore wings, dentate on the veins, within which one or two more lines are more or less distinctly visible. The apical and intervenular black lines are reproduced. Three nearly parallel dark brown lines, dentate on the veins, cross the middle of the under side of the hind wings, and the outer margin is shaded.

The young larva is of a delicate green color, acutely granulated, especially when it has recently molted. The mature larva is from three to five inches long, and is very variable in its ground color which is usually some shade of green, with a darker head, and seven oblique whitish or greenish yellow beaded stripes on each side. The caudal horn is nearly black, and spiny. Occasionally the ground color is dark brown and they are even said to be black sometimes. At maturity they descend into the ground where they transform into dark brown pupæ with the tongue-case detached, cylindrical and bent like a jug handle, the enlarged or bulbous end touching the body at about the outer third of the wing cases.

This species feeds on the leaves of Tobacco, Tomato, Jamestown weed (*Datura stramonium*), Matrimony Vine (*Lycium vulgare*) and Ground Cherry (*Physalis viscosa*).

13. PHLEGETHONTIUS CINGULATA, Fabricius.

Phleg-e-thon'-ti-us cin-gu-la'-ta.

Expanse of wings, from four to four and one-half inches.

Head and thorax above, grayish brown. Palpi brownish gray above and whitish beneath. The prothorax has two transverse black lines, and there is one of the same color through the middle patagiæ. The metathoracic tufts are black, edged in front with blue, and behind with yellow. The abdomen is brownish or ashy gray, with five rose pink quadrate spots along each side, which diminish in size towards the apex. These spots are separated by black bands. The sides of the thorax, abdomen and all the legs are of a lighter gray color, while the under side of the body is whitish with a row of three or four black spots along the middle of the under side of the abdomen.

The fore wings are brownish gray with a small gray spot at the base. The discal spot is small, kidney-shaped, pale gray and encircled with black. A pair of dark brown angulated lines crosses the wing just within the discal spot, and three similar lines cross outside of the discal spot. These two sets of lines are joined by a dark brown shade with two black dashes in it below the cell, thus forming with the upper and darker parts of the lines, a large quadrate dark area which rests on the middle of the costa, and extends rather more than half way across the wing, containing the reniform or discal spot. A row of gray circlets rests on the veins along the outer margin, their inner sides being formed by the outer dentate line. An irregular black line, shaded above with gray, extends obliquely inward from the apex. The fringes are brown and marked with white between the veins. The hind wings are rose pink at the base and are crossed by three black bands. The terminal space is ashy gray, and the space between the outer black bands is whitish or pale gray. Fringes, brownish gray, marked with white between the veins. The under side of the fore wings is mouse colored with a faint trace of three cross lines beyond the cell. The under side of the hind wings is brownish gray, whitish between the median and terminal bands and along the hinder margin. The middle of the wing is crossed by three dentate brown lines which unite at the middle, forming a black band the rest of the way.

The larva presents a number of varieties, as shown by Prof. Lintner, which reduce themselves to two principal types; those having the ground color green, and those having the ground color brown; and he has described three varieties under each type. The first is of a dark green ground color with seven oblique black bands on each side, which terminate above in a longitudinal stripe of the same color, often indistinctly marked and always interrupted between the segments, extending from the fourth segment to the caudal horn, and bordered on the under side with white. There are two black spots on the top of the third and also of the fourth segments, and four very small ones on the tenth, and a large one on the side between the first and second segments. The head is green, slightly yellowish, with five perpendicular black lines, of which the middle one is divided near the lower end. Legs blackish, caudal horn smooth, yellow or ferruginous and with a black tip. The caudal shield is orange yellow.

The second variety differs in being of a clearer green, and in having the oblique stripes white and the longitudinal stripes reduced to two rows of black dots. The third variety dull green with six rows of blackish or brownish spots, and the head and caudal horn are ferruginous.

The first of the brown varieties is of a dead leaf brown color on the back, white on the sides and flesh colored underneath. There are seven oblique lateral stripes of a deeper brown, and a lateral stripe of straw color which is continuous on the first three segments and which, beginning on the next segment, is interrupted on the middle of each of the following. The head is pale fawn colored with the same black lines as in the first green variety. The legs are blackish, the caudal horn entirely black and the caudal shield orange yellow. The second brown variety has four longitudinal lines ot a dirty white on the first three segments, of which two are dorsal and two lateral, with two points of the same color on these four segments placed near the incisures. The third variety is entirely earthy brown with the back and oblique stripes of a deeper brown. Intermediate forms between these varieties are met with, but in all those of a brown ground color, the body is annulated with numerous blackish furrowed lines which are cut by others longitudinally, forming small squares.

The pupa is yellowish brown, with the tongue-case very long, detached from the breast and doubled upon itself, reaches more than half way back to the head. The returning portion rests on the breast.

This species feeds on the leaves of the Sweet Potato and other species of the Convolvulus family; also on Jamestown weed (*Datura stramonium*). The moth has been taken on flowers in Orono late in August.

Genus IX, SPHINX, Linneus, Syst. Nat. ed. X, Vol. 1, p. 489 (1758).

Head prominent; proboscis as long as the body or longer (sometimes a little shorter); palpi moderate in size, closely scaled and pressed against the front of the head; eyes of medium size and lashed; antennæ fusiform, ending in a short, curved, ciliated seta; thorax well developed, somewhat advanced in front of the base of the fore wings; with short, erect metathoracic tufts; abdomen cylindrical and tapering, without anal or side tufts, the posterior edge of the segments armed with round spinules; fore and middle tibiæ spinose, the middle tibiæ with one pair of long spurs, the hind tibiæ with two pairs.

The fore wings have twelve veins (sometimes only eleven), and are of medium width, with very oblique and entire outer margins. The outer margins of the hind wings are nearly entire, being but slightly produced on vein 1 b.

The New England species may be separated by means of the following table:

1	Fore wings dark smoky brown with the costa broadly marked with whitish or pale gray, *S. drupiferarum.*	
	Fore wings not colored as above	2
2	Fore wings pale ferruginous brown with a small darker brown discal spot..................*S. kalmiæ.*	
	Fore wings not colored as above	3
3	Hind wings ochre yellow with dark brown or black terminal border ....*S. luscitiosa*	
	Hind wings without any yellow....................	4
4	Patagiæ gray, edged with black but without a central stripe ....*S. chersis.*	
	Not marked as above..........................	5
5	Discal spot white..........	6
	Discal spot not visible.............*S. canadensis.*	
6	Thorax above, dark brown............*S. gordius.*	
	Thorax above, brownish gray ....*S. eremitus.*	

14. SPHINX DRUPIFERARUM, Abbot and Smith.

Sphinx dru-pif-e-ra'-rum.

Plate I, Fig. 2.

THE PLUM-TREE SPHINX.

Expanse of wings, three and a half to four inches.

The head, palpi and thorax are blackish brown with a broad light gray or whitish stripe along each side. These stripes meet on the front of the upper part of the head and the tip of the palpi. The middle of the posterior part of the thorax is brownish gray with black tufts on each side. The abdomen is brownish gray with a black line along the middle and a broad black band along each side, which contains a row of four or five whitish spots. The under side of the abdomen is gray with a dark line along the middle and one on each side. The under side of the thorax is darker gray and still darker in front.

The fore wings are dark smoky brown with light gray or whitish on the costa from the base nearly to the apex, and extending in width to the median vein. The outer margin is of the same color, being widest behind and not reaching to the apex. The brown portion of the wing is covered by several very oblique blackish brown wavy or angulated lines which appear on the costal portion as reddish brown streaks. The gray space along the outer border has a white line through the middle of it, parallel with the border, and the space is limited within by a fine black line with white on the inside, and angulated between the veins. The discal spot is represented by an oblique fine black line, from which a double line of the same color extends in along the middle of the cell, and a single one outward on vein 5. An oblique apical streak extends in across the intervenular space, and is nearly connected with another in the space below. There are also black dashes on the dark brown portion of the wing between veins 1 and 2; 2 and 3; 3 and 4, and also between 5 and 6.

The hind wings are dark brown with a whitish base, narrow central band and a brownish white outer border. All the fringes are smoky brown. The under side of the wings is dark gray, with the outer border and a central band toothed on the veins in the hind wings, smoky brown. The under side of the fore wings is crossed on the outer part by a smoky brown line which is toothed on the veins, and the line is shaded with lighter on each side. The oblique apical line is reproduced on the under side.

The eggs are of a pale yellowish green color, smooth, slightly oval in outline and about one-fifteenth of an inch in diameter. They hatch in six or eight days, and the young larva is about one-fifth of an inch long, pale yellowish green, with a few whitish tubercles over the surface, which are surmounted with fine short hairs. The caudal horn is one-tenth of an inch long, nearly erect, black and thickly covered with short black hairs.

The full grown larva, Plate I, Fig. 3, is about three inches and a half long and of a bright apple green color. The head has a vertical dark brown or black stripe on each side, and there are seven oblique white stripes on each side of the body, which are bordered on the upper side with light purple or mauve. The spiracles are of a bright orange color. The caudal horn is dark brown with yellow at the base of the sides.

The pupa, Plate I, Fig. 4, is about an inch and a half long, of a dark reddish brown color, and the short tongue-case is free from the body and swollen at the end. This insect feeds on the leaves of Apple, Plum and Lilac.

15. Sphinx kalmiæ, Abbot and Smith.

Sphinx kal'-mi-æ.

Expanse of wings, from three and a half to four inches.

Head and thorax, chestnut brown on top, whitish or yellowish along the sides. A chestnut brown stripe extends from beneath the wings forward including the eyes and the middle of the palpi, leaving these last whitish beneath and at the end. The patagiæ are edged above with black, and a line of the same color runs through the middle of them, separating the brown above from the light color of the sides. The metathoracic tufts are black. The top of the abdomen is chestnut brown, or pale brown, with a black central line, and a broad black band broken by a whitish cross stripe on the edge of each segment, runs along each side. Under side of thorax and abdomen, dull white with three or four black points along the middle of the latter.

The fore wings are pale yellowish brown, stained and marked with coffee brown, especially on the outer part. The extreme costal edge and the hinder margin, a small oblique discal spot, a pair of very oblique cross lines visible only on the basal fourth of the costa, and near the base of the hinder margin, are all coffee brown, and the veins and dashes between are of the same color. Just within and parallel to the outer margin is a whitish line shaded on its inner side with blackish, broken by the veins. An oblique black line edged above with whitish, extends inwardly from the apex. All the fringes are marked alternately with reddish brown and whitish. The hind wings are whitish or pale yellowish white with a central and terminal dark brown band. The under side of all the wings is reddish brown with an indistinct terminal darker brown band, and an indistinct central band on the hind wings appears in some specimens.

The full grown larva is three inches long, with a rather small flat head of a clear apple green color, yellowish on the sides and with a lateral black stripe. The body is apple green in color, lighter above and darker on the sides. There are seven oblique stripes on each side, confined to one segment each, which are whitish through the middle, yellowish on the lower side and dark blue, almost black on the upper side. The caudal horn is light blue thickly studded with shining black tubercles, and is quite curved. The caudal shield and anal plates are yellowish green and dotted with small black elevated points. Spiracles, pale orange, their upper portion extending into the yellow of the bands. Legs, black and pearly at the base. Prolegs with two black spots on the outside separated by yellow, or connected posteriorly by a black line.

The pupa is dark brown, and the tongue-case, which reaches to about one-fourth the length of the wing cases, is free from the body, touching it only by the swollen or bulbous outer end.

This species feeds on the leaves of Ash, Lilac and Mountain Laurel (*Kalmia latifolia*).

16. Sphinx chersis, Hübner.

Sphinx cher'-sis.

Expanse of wings, from four to five inches.

Head, palpi and thorax, ashy gray. A brownish stripe extends from the apex of the palpi to the eyes, and is continued as a black line along the side, under the wings. The patagiæ are edged above with black, and the metathoracic tufts are of the same color. The abdomen is ashy gray with a central black line and a broad black band on each side, broken by four or five white cross stripes. The under side is paler than above, and has a row of small black spots along the middle of the abdomen.

The fore wings are ashy gray with a dark smoky brown cluster of hair-like scales at the base behind the origin of vein 1. The discal spot is not usually perceptible, but a black line runs along the middle of the outer part of the cell crossing the position of the discal spot. There are black dashes between all the veins below the apex, the last two nearly uniting in an oblique apical streak. There are two or three light and dark subterminal shade lines which do not reach the costa. The hind wings are pale gray with dark smoky brown median and terminal bands. The fringes are all pale ashy gray. The under side of all the wings is ashy gray with an ill-defined terminal band, a dentate central band on the hind wings continued on the fore wings, all a little darker than the ground color.

The mature larva is from three to three and a half inches long, greenish or bluish white, paler above than below. The head has a vertical yellowish stripe on each side, and there are seven oblique stripes on each side which are pale yellow and edged on the upper side with dark green. These stripes cross one entire segment and three-fourths of the one behind it. The spiracles are black, surrounded with white. The caudal horn is rose colored, and sometimes tipped with blue. Caudal shield edged with light green. Legs, rose color.

The pupa is two inches long, of a chestnut brown color, and the tongue-case touches the body only at the slightly bulbous tip.

This species feeds on Ash and Lilac.

17. Sphinx canadensis, Boisduval.

Sphinx can-a-den′-sis.

Expanse of wings, three and one-half inches.

Head, thorax and abdomen, light brownish gray. The patagiæ are edged above with black, and there is a dark line through the middle, below which the sides of the thorax and head above the eyes are paler than above. Metathoracic tufts, black. The abdomen has a central black line and a broad black band more or less broken by sordid white on the edges of the segments, along each side. The under side is lighter than above, and has a central black line and a similar one on each side of the abdomen.

The fore wings are light brownish gray with a cluster of blackish hair-like scales at the base below the origin of vein 1. The wings are crossed by several very oblique cross lines, visible only on the costa and near the base of the hinder margin. A subterminal black line edged with whitish extends nearly to the apex, followed by another within. Black dashes occur between the veins as far as the apex. Hind wings, pale gray with a spot at the base, a central and a subterminal band, dark smoky brown. The terminal space is brownish gray. The under side of all the wings is brownish gray with a darker, dentate central band on the middle of the hind wings.

This very rare moth was taken at flowers in Bangor, Maine, early in July, by Prof. Carl Braun, who kindly loaned me specimens for study. The early stages and food plant are unknown, but Mr. Roland Thaxter, from whom I have received many valuable notes on the Sphingidæ of New England, wrote me as follows: "I found two small sphinx larvæ ready for their last molt, last summer [1885] on the 'bake apple' marshes in Newfoundland, as the high, open peat bogs there are called. One was on bake apple (*Rubus chamæmorus*), the other creeping among the low Ericaceous plants, and both fed in confinement on low bush blueberry. They were much like *S. drupiferarum* and *S. gordius*, but differed noticeably from either. Unfortunately I lost them before taking a description. Near by, on the marsh, I found a battered dead female *S. canadensis* and have little doubt that this larva was of the same species."

18. Sphinx gordius, Cramer.

Sphinx gor'-di-us.

Plate I, Fig. 1.

THE APPLE SPHINX.

Expanse of wings, three inches and one-half.

Palpi, reddish brown except the apex which, with the head, sides and sometimes central part of the thorax are gray. The rest of the thorax is blackish brown with black metathoracic tufts. The abdomen is ashy gray with a central black line and a broad tapering black band on each side, broken by four or five dull whitish cross stripes. Under side of thorax and abdomen, gray.

The fore wings are gray, clouded with brownish. The discal spot is small, white and triangular, and from it two fine black lines extend in along the cell and finally unite. The median vein and veins 2, 3, 4, 5 and 6 are marked with black, and there are black dashes between all the veins below the apex, the last forming the oblique apical streak. A curved ashy brown shade crosses the wing at the basal fourth, another, from the costa a little beyond the middle, ends at the middle of the hinder margin, and a third, crossing a little beyond and parallel to the last, is somewhat toothed on the veins. Outside of this a blackish shade line, bordered on each side with gray, is visible only on the hinder half of the wing. An ashy brown spot rests on the costa a little before the apex, leaving a gray shade on the upper side of the oblique streak. Fringes, brown at the ends of the veins, and white between.

The hind wings are sordid white with a central and broad terminal band nearly black. Fringes, pure white. The under side of the fore wings is brownish gray, and the fringes are as above. The under side of the hind wings is gray with a narrow central, and broad terminal band of dark brownish gray.

The mature larva is about two inches and a half long, of a bright apple green color, with a brownish vertical stripe on each side of the head, and seven oblique stripes on each side of the body, which are white and margined above with violet. The caudal horn is reddish brown. The pupa has a very short, detached tongue-case.

This species feeds on the leaves of Apple, Ash, *Myrica gale* and *Myrica cerifera.*

19. Sphinx luscitiosa, Clemens.

Sphinx lus-cit-i-o'-sa.

Expanse of wings, from two and a half to three inches.

Head and sides of thorax, gray. Back part of the head above and the upper part of the thorax, black, the latter with a few blue and gray scales on the back part. A broad brown stripe extends from the middle of the palpi back under the wings. The abdomen is dull ochre yellow (gray in the females), with a black line along the middle and a black band broken by dull yellowish white on the edges of the segments, along each side. The under side of thorax and abdomen is pale gray.

The fore wings are pale brown with the margins sooty black. The band on the outer margin is narrower towards the apex, and has the inner edge wavy. More or less of the veins are black, and a black line extends in along the middle of the cell from the small whitish discal dot. This line is double at first, but the two parts unite inwardly. A short black dash rests on the intervenular spaces as far as the apex, the last forming the oblique apical streak. Fringes, black. The hind wings are bright ochre yellow (grayish in the females), with a broad black terminal border and a faint indication of a central band. Fringes, yellowish. The under side of all the wings is dull ochre yellow with broad terminal black bands. In the female, all the yellow is replaced by dull gray.

Rev. G. D. Hulst, who has sent me some valuable notes of the Sphingidæ, wrote me that this rare species had been bred near Newark, New Jersey, on Willow.

20. Sphinx eremitus, Hübner.

Sphinx er-e-mi'-tus.

Expanse of wings, from two and a half to three inches.

Head, palpi and thorax, brownish ash colored. A brown stripe extends along the outer side of the palpi, and a black line extends from the eye along under the wing. A broad black stripe extends through the middle of the patagiæ, and they are edged above with black. Metathoracic tufts, black. The abdomen is brownish ash colored with a black line along the middle, and a broad black band broken by white on the edges of the segments, along each side.

The fore wings are brownish ash colored with a white discal spot set on a black longitudinal dash, and there are black dashes between the veins from the first to the oblique apical streak, which has a lighter shade on its upper side. A pair of blackish brown stripes starts from the costa a little outside of the base, runs out to the median vein where they form an acute angle, then across the wing to the hinder margin near the base. Another pair crosses the wing a little outside of the last, and a third pair starts from the outer fourth of the costa and crosses to the hinder margin a little inside of the anal angle. The hind wings are white with a black spot on the base, a median, and a broad terminal black band. The under side of the fore wings is dark ashy gray with a faint subterminal line slightly paler. The under side of the hind wings is whitish with the bands of the upper side reproduced.

The young larva before its final molt, is one inch and a quarter long, of an apple green color, with a horn-like projection on the forward part of the third segment, on each side of which there are two light purple blotches, the forward one of which is the largest. There are one or two similar spots on each side of the caudal horn, and a few purplish dorsal dots. The caudal horn is short, blunt and slightly curved.

The mature larva is from two inches and a quarter to two and three-quarters long, as stated by Prof. Lintner, while Prof. Snow gives three inches and a half for the length. The head is rather small and dark brown with a whitish, vertical stripe on each side. The abdominal segments are reddish brown with numerous tan colored or whitish ocellated spots on the annulations. The second segment is light brown above, olive brown on the sides, and the collar is light brown, outlined with black. The anterior of the third segment is triangular as seen from above and laterally, with the apex slightly rounded—extending horizontally and beyond the head when at rest—olive brown on the sides with a small black velvety spot anteriorly on the incisure of the second and third segments, not visible when contracted. The third and fourth segments are olive brown on the sides, and have a black velvety spot extending over one-half of the former and two-thirds of the latter—acutely pointed in front and rectangulated on the sides near its base which is one-half of its diameter, in general shape resembling that of a spear head—bordered, except behind, by white or light buff, shading into the brown of the body. Seven lateral bands of whitish ocellated spots, crossing one segment, and bordered posteriorly with darker brown, which is continued nearly across the following segment. The caudal horn is dark brown, one-tenth of an inch long, curved, granulated and shriveled as if about to disappear. Legs and prolegs black. Before pupating, its color changes to dull purple, and the caudal horn becomes nearly obsolete. The pupa is an inch and three-fifths long and of a chestnut brown color. The exserted tongue-case is two-fifths of an inch long and the end is swollen into a bulb. (Lintner).

Mr. Thomas W. Fyles gives the following brief description of the larva. "Sepia-colored — slightly granulated like shagreen'— having a varnished appearance. Anal horn black, rather small. The first two segments (i. e., those to which the prolegs (?) are attached), horn-colored and semi-transparent, having *two black shield-shaped blotches upon them, of which the hinder is much larger than the former.* Prolegs, black. Transverse side lines whitish, the hindermost of them broader than any of the others. Spiracles, black. Head with two longitudinal whitish lines."

This species feeds on Spearmint (*Mentha viridis*), Wild Bergamot (*Monarda fistulosa*) and several species of *Salvia*.

Genus X, DOLBA, Walker, Lep. Het. part 8, p. 289 (1856).

Dol′-ba.

Head rather small, roughly scaled, inclining to form a tuft between the antennæ, not sunken into thorax; proboscis longer than the body; palpi extended horizontally in front, roughly scaled; eyes moderate in size and lashed; antennæ fusiform, somewhat bent at the end; thorax short and stout; but little advanced beyond the base of the fore wings, with short, stout and erect metathoracic tufts; abdomen conical, without anal or side tufts; segments armed with round spinules on the posterior edges; tibiæ not spinose, the middle tibiæ with one pair of long spurs, the hind tibiæ with two pairs.

The fore wings have eleven veins, an entire outer margin, but slightly excavated on the end of vein 2. The hind wings have an entire outer margin, somewhat produced on vein 1 b.

21. Dolba hylæus, Drury.

Dol′-ba Hy-læ′-us.

Expanse of wings, from two inches to two inches and one-half.

Palpi whitish beneath, dark brown above. Head, thorax and abdomen dark rusty brown. The thorax is white on the sides with two white dots on top, while the metathoracic tufts are black. The abdomen has a central row of dark brown spots, a row of small white spots on each side, and a dark brown band along each side, broken by white on the edges of the segments. The under side of the thorax and abdomen is white.

The fore wings are dark rusty brown with a white spot on the base, and one at the end of the disk. Three dark brown lines cross the wing from the basal third of the costa, the inner ones accompanied by two diffused white ones. There are four dark brown lines, dentate on the veins, which cross the wing from the outer fourth of the costa, the outer ones with more or less white between them. A white spot rests on the apex, and there are some indistinct shadings of white along the outer margin. Fringes, dark brown cut with white between the veins.

The hind wings are dark smoky brown with two parallel, dentate, white lines across the middle, the inner one scarcely visible except near the hinder margin. There is also a whitish band near the base of the wing, divided along vein 1 b. Fringes, pure white, cut with brown at the end of the veins. Under side of all the wings, dark ashy gray with the outer lines faintly reproduced on the fore wings, and there are three dentate lines followed by a whitish shade across the middle of the hind wings. These lines unite near the anal angle.

Abbot and Smith figure the larva of this species, feeding on Ink berry (*Ilex glabra*), and the description of Clemens taken from this figure is as follows: "Head green, with a pale blue line on each side. Body pea green, with lateral oblique pink bands edged below with white; caudal horn crimson." "Pupa reddish brown; tongue-case not apparent."

Mr. S. H. Scudder gives a description of the larva of one of the *Sphingidæ* which he says, "very probably belongs to this species," and as it is so complete we give it here.

"*Penultimate stage.* General color, green. Head scabrous, and, like the body, thickly covered with raised yellow dots; a narrow yellow stripe on each side, the two nearly meeting on the summit and extending to the base of the antennæ; just behind its lower extremity a black dot; mouth-part, black. The seven oblique sphingial bands extend each from the anterior edge of the segment, a little below the spiracle, over that whole segment and two-thirds of the succeeding, upon which they are less oblique; these bands vary from yellow, much paler and fainter on the posterior segment, to red, deepening to crimson anteriorly and changing posteriorly to a slightly rosy white, and upon the succeeding segment to greenish yellow; the last band, however, extends with double width upon the eighth abdominal segment, and, with a color as deep as upon the anterior segment, one-third way up the caudal horn; these bands are all bordered above by a band of equal breadth, of a crimson color, which dies out just before reaching the posterior border of the segments, excepting on the eighth segment, where it continues, as a delicate edging of the lower band, to the extremity of the horn, which is tipped with dark brown, while the basal third of the horn above, between these edgings, is green; the rest of the horn not covered by these markings is black, Edges of the last segment pale yellow; spiracles testaceous with white areola. Length 28 mm., breadth 5 mm.

Mature larva. Head scabrous; color and bands as in previous stage, excepting that the latter are parti-colored, being yellowish green in front and black behind; antennæ and labrum yellowish; other mouth-parts black. The sphingial bands occasionally do not pass to the succeeding segment, but usually they do, and they may be either yellow or white (in the latter case with a yellow tinge posteriorly), edged as before with crimson, and this crimson often followed above by a narrow margin of black, sometimes broken, and extending on the eighth abdominal segment as an edging of the yellow stripe (which here is always yellow), and on this segment never wholly wanting. The horn is black on the sides, with a slight lateral yellow stripe; green above and beneath. The whole body profusely sprinkled with circular white dots having a black areola, but the areola often wanting on the upper surface and sides of the abdominal and first thoracic segments, or the spots may be wanting altogether on the upper surface of the same segments. Spiracles testaceous, changing afterwards to a bright reddish color; prolegs light brown. Length 57 mm. Feeds on Sweet Fern (*Comptonia* *asplenifolia*). Collected on Cape Cod and at Princeton, Mass., and in Connecticut."

Besides the food plants already mentioned, Mr. G. R. Pilate states that it feeds on Papaw (*Asimina triloba*).

Genus XI, DILOPHONOTA, Burmeister, Abhandl. nat. Gesellsch. Halle, p. 69, gen. 6 (1885).

22. DILOPHONOTA ELLO, Linneus.

Dil-o-pho-no′-ta el′-lo.

I have seen a single example of this southern species which was captured by Mr. E. F. Hitchings in Warren, Mass., but think it very doubtful whether it is to be considered a New England species, nevertheless, I give the following description of it.

Expanse of wings, three inches and a half.

Head, thorax, abdomen and fore wings, gray, sometimes with a purplish luster. The abdomen has cross bands on each side, of black and gray alternately. The under side of the thorax and abdomen is a little lighter than above. The fore wings are excavate between the veins on the outer margin, and there are faint indications of cross lines showing only on the costa at the base, middle and outer fourth. The hind wings are rust red with a broad dark brown or black terminal band which does not reach to the anal angle. The under side of all the wings is brownish gray tinged more or less with rust red.

The mature larva has the head purple; body obscure brown, with a black dorsal line, and spotted irregularly with white on the sides; caudal horn purple. (Merian).

The food is said to be leaves of a species of *Psidium* or Guava.

Genus XII, HYLOICUS, Hübner, Verz. bek. Schm., p. 139 (1818).

Hy-loi'-cus.

Head prominent with a slight tuft between the antennæ; proboscis about the length of the body; palpi close to the front, densely scaled on the second joint so that it appears enlarged at the end; eyes large, slightly lashed; antennæ fusiform, slim and bent near the tip; thorax stout, considerably advanced in front of the fore wings, with short, stout metathoracic tufts; abdomen cylindrical and tapering, without anal or side tufts, the segments with round spinules along hinder edge; tibiæ unarmed except the fore tibiæ which have a few spines near the lower end, middle tibiæ with one pair of long spurs, hind tibiæ with two pairs. The first joint of the fore tarsi has a row of three or four stout curved spines on the outer side.

The fore wings have twelve veins and entire, rounded outer margins. The hind wings have the outer margin produced on vein 1 b, otherwise entire.

Is this genus structurally distinct from *Phlegethontius?*

23. Hyloicus plebeius, Fabricius.

Hy-loi'-cus ple-be'-i-us.

Expanse of wings, three inches.

Head, palpi, thorax and abdomen, dark gray. The palpi are whitish beneath, and have a brown stripe across the outside, which extends back, including the eyes, under the wings. The collar is edged behind with black, and a black stripe extends through the middle of the patagiæ, below which the side of the thorax is paler. The abdomen has a central dark line and a broad band of the same color enclosing a row of four or five whitish spots along each side. The under side is pale yellowish or sordid white.

The fore wings are gray with a white discal spot encircled with black, and there are heavy black dashes between the veins from the base along below the median vein to the apex. The usual cross lines on the basal part of the wing appear as a pair of oblique brown faint stripes from the basal fourth of the costa to the cell, and there are three indistinct brown lines across the outer part of the wing, dentate on the veins. The fringes are alternately white and brown, the latter color resting at the ends of the veins which are also marked with brown at their extremities. The hind wings are dark smoky brown, grayish towards the base and on the anal angle. Fringes alternately brown and white. The under side of the fore wings is ashy brown with a darker, dentate line across the outer part. The under side of the hind wings is paler than that of the fore wings, but has a dark gray terminal band and dentate line continuous with that on the fore wings. Sometimes there is a second line crossing the middle of the wing.

The mature larva is nearly three inches long. The head is light pea green, somewhat scabrous, with a black band on each side, passing from near the top of the head to a point behind the antennæ. Antennæ and labrum white; the other mouth-parts black. Body light pea green; the seven oblique sphingial bands are formed of a narrow white stripe, edged posteriorly with lemon-yellow and anteriorly with black, in front of which the green of the body is darker than elsewhere; the black does not quite reach the edges of the segments, the white dies out a little sooner than the black, while the yellow reaches both edges, and in the last stripe extends over the base of the caudal horn; the spiracles, which are faint brownish red, are half immersed in the yellow stripes. The caudal horn curves only on its apical half, and is light blue, covered with black tubercles irregularly, and so thickly that the terminal third is entirely black. Last segment and proleg dotted with black warts, and the edges furnished with a few very short hairs. First joints of jointed legs white, with a black spot on the outer surface; the others black, and all furnished with a few white hairs. Prolegs green, the tip furnished exteriorly with a large black spot; the hooks black. Length

75 mm., breadth 11 mm. Feeds on *Syringa vulgaris*. Collected on Cape Cod, Mass. (S. H. Scudder).

Mr. William Beutenmüller, Jr., has given me the following food plants of this species. Trumpet Creeper (*Tecoma radicans*) and *Tecoma grandiflora*. He also informs me that the larvæ hide away during the day, on the under side of the stems they feed on, and that it is rather difficult to find them.

Sub-Family—CHŒOCAMPINÆ.

Genus XIII, DEILEPHILA, Ochsenheimer, Schm. v. Europa, Band IV, p. 42 (1816).

Dei-leph'-i-la.

Head of moderate size, not sunken into the thorax, smoothly scaled; proboscis as long or nearly as long as the body; palpi ascending close to the front, the clothing giving the end a swollen appearance; antennæ gradually and uniformly enlarging outwardly to near the end, when they are constricted suddenly into a minute bristly hook; eyes moderate in size and lashed; thorax stout, untufted and produced considerably in front of the fore wings; abdomen smooth, cylindrical, tapering rather suddenly at the terminal segments, without anal or side tufts, the hinder edge of the segments armed with spinules; tibiæ not spinose, middle tibiæ with one pair of long unequal spurs, hind tibiæ with two pairs; fore tarsi with a row of stout curved spines along the outside.

The fore wings have eleven veins (sometimes twelve), with the outer margins rounded and entire. The outer margin of the hind wings is entire except at the end of vein 1 b, where it is somewhat produced.

The New England species may be distinguished as follows:

Veins of the fore wings lined with white, *D. lineata*.
Veins of the fore wings not lined with white, *D. chamænerii*.

24. Deilephila chamænerii, Harris.

Dei-leph'-i-la cham-æ-ne'-ri-i

Plate II, Fig. 1.

Expanse of wings, nearly three inches.

The upper side of the head and thorax is olive brown with a white stripe along each side, which is edged with black on the upper side along the thorax. The palpi are whitish beneath and olive brown above. The abdomen is olive brown with a row of small white spots along the middle. The first and third segments are marked with black on the sides; the second, fourth and following segments, with white, some of them more or less suffused with pink. The under side of the thorax and the legs are of a dull yellowish brown, and the abdomen is darker brown with white lines along the edge of the segments. The fore wings are olive brown with a buff colored band extending from the hinder margin near the base, to the apex of the wing. The lower edge of this band is slightly sinuous and the upper is irregularly indented. There is a black patch on the base of the wing and another at the end of the cell, and the terminal space and fringes are olive gray. The hind wings are black with a rose red central band which ends in a white spot on the hinder margin. The outer margin is narrowly edged with dull brown which is sometimes stained with reddish. Fringes, white.

The mature larva is from two and a half to three inches long. The head is dull red with a black stripe across the face. The upper side of the body is deep olive green and polished, with a pale yellowish line along the middle of the back, terminating at the base of the caudal horn; and there is a row of pale yellow spots on each side from the third to the twelfth segments inclusive. These spots are placed on a wide blackish band which crosses the forward part of each segment, and the sides of the body below the spots are thickly sprinkled with minute yellowish dots. The caudal horn is long, curved backwards, red, tipped with black and with the surface rough. The spiracles are oval, yellow, and margined with black. The under side is pale pinkish green with black legs, while the prolegs are pink with a black spot on the outside of each. Transformations subterranean.

This larva feeds on the leaves of Grape, Evening Primrose (*Œnothera biennis*), Great Willow-herb (*Epilobium angustifolium*) and *Epilobium coloratum.*

This is a very common species at Orono and flies about flowers in the twilight, in June and July.

25. Deilephila lineata, Fabricius.

Dei-leph'-i-la lin-e-a'-ta.

Plate II, Fig. 2.

Expanse of wings, nearly three inches and a half.

The upper side of the head, thorax, abdomen and fore wings is olive brown. There are three parallel white stripes along each side of the thorax; the first over the base of the wings and extending forward over the eyes to tip of the palpi; the second through the middle of the patagiæ, and the third along the upper edge of the patagiæ. There is also a white line running from the top of the head back through the middle of the collar. There is a double row of elongated black spots with a central row of small white ones, along the middle of the abdomen, and on each side is a row of alternate black and white spots, decreasing in size towards the end of the abdomen, below which the sides are tinged with reddish.

The fore wings have a buff stripe extending from near the base of the hinder margin to the apex, overlaid on the basal part with whitish hairs. The hinder margin is narrowly edged with white, and veins 1 to 7, as well as the discal or cross vein, are marked with white as far as the terminal space which is purplish gray. The fringes are somewhat lighter. The hind wings are black with a central reddish band which encloses a whitish spot near the hinder margin. The outer margin is narrowly edged with brownish tinged with reddish. Fringes, white. The entire under side is paler than above, and the lighter portions of the wings are more or less sprinkled with brown.

The mature larva is about three inches long and quite variable. The most common form (Plate II, Fig. 3) is of a yellowish green color with a row of prominent spots along each side, each spot consisting of two curved black lines enclosing a crimson patch above and a pale yellow line below, the whole being connected by a pale yellow stripe edged with black. In some instances these spots are disconnected and the space between the black crescents is of a uniform cream color. The other form of the larva (Plate II, Fig. 4) is black with a yellow line along the middle of the back and a double series of yellow spots and dots along the side. Caudal horn yellowish orange towards the extremity, and rough.

The pupa is light brown, the head-case compressed laterally and prominent; tongue-case not apparent. (Clemens).

The larva of this species feeds on the leaves of Apple, Grape, Plum, Currant, Gooseberry, Buckwheat, Turnip, Watermelon, Chickweed (*Stellaria*), Bitter Dock (*Rumex obtusifolius*), Evening Primrose (*Œnothera biennis*), Common Purslane (*Portulaca oleracea*).

Genus XIV, PHILAMPELUS, Harris, Am. Jour. Sci. Vol. XXXVI, p. 299 (1839).

Phi-lam'-pe-lus.

Head rather large, free and prominent, smoothly scaled; proboscis as long as the body; palpi ascending, pressed close to the front; eyes large, not lashed; antennæ slender, fusiform and hooked at the end; thorax stout, moderately extended in front of the base of the fore wings; abdomen large, cylindrical and tapering to a point without anal or side tufts, the segments armed with spinules on the hinder edge; tibiæ not spinose, middle tibiæ with one pair of long, very unequal spurs, the hind tibiæ with two pairs.

Fore wings with eleven veins, and the outer margin is entire and rounded, or more or less excavate between the apex and the end of vein 4. Hind wings slightly produced on vein 1 b, elsewhere entire.

The New England species may be distinguished as follows:

1. Thorax with an olive green spot on each side........ 2
   Thorax with a deep reddish brown spot on each side, *P. achemon.*

2. Hind wings marked more or less with rose red, *P. vitis.*
   Hind wings without any rose red markings, *P. pandorus.*

26. Philampelus vitis, Drury.

Phi-lam'-pe-lus vi'-tis.

Expanse of wings, about three inches and a quarter.

The head, thorax and abdomen are pinkish gray above and beneath. A diffuse line along the middle of the head and thorax, and a large triangular spot on the patagiæ, olive green. A spot on each side of the base of the abdomen and a longitudinal stripe on each side of the middle above, pale cinnamon brown.

The fore wings are bright olive green with a pale flesh colored stripe extending from the middle of the base to the apex, and crossed by a similar one which extends from the middle of the hinder margin to the outer fourth of the costa, leaving a triangular spot of olive green on the outer part of the costa. This oblique stripe has two imperfect brown lines running through it. The terminal space and costa as far as the triangular green spot, are purplish flesh color. The discal spot, and veins 2, 3, and 4 are of a light flesh color where they cross the green. From the basal fourth of the hinder margin, a flesh colored line, shaded within, extends directly up to the central stripe.

The inner part of the hind wings is rose red with two black spots on it. The costal and middle part is covered with long whitish hairs which have a greenish tinge. The outer margin of the wing from the apex down to vein 2, is rose red with a black band on the inside. The rose red terminal band is ended by a greenish brown quadrate spot.

"*Young Larva.* Green, with yellow lateral stripes edged with black, and a long, recurved, slender, reddish horn."

"*Mature Larva.* Head, reddish brown. Body, pale reddish brown on the dorsum, with a darker vascular line, and pale reddish subdorsal line on each side, and the general color deepened laterally. Six lateral, short, irregularly-oval white patches bordered with black, containing spiracles. The anterior wings are dotted with blackish. The lenticular tubercle is black, and contained in a brown patch edged with adjacent black and white lines.

Food Plant. The grape." (Clemens.)

This southern species has been taken as far north as Massachusetts.

27. Philampelus pandorus, Hübner.

Phi-lam'-pe-lus pan-do'rus.

Plate III, Fig. 1.

Expanse of wings, from four inches to four inches and a half.

Color above and beneath, greenish white, marked with spots and shades of rich olive green. A line along the middle of the head and thorax, a large triangular spot on the patagiæ and one across the hind part of the thorax and on the base of the abdomen, are all of a rich olive green color.

The fore wings have a large olive green spot on the middle of the hinder margin and a lighter shade connecting it with the base of the wing. A triangular spot of green rests on the hinder margin just within the anal angle, and there is a similar one, somewhat diffuse, on the costa a little within the apex. There is also a triangular greenish shade on the outer third of the costa extending down to vein 3. The wing is crossed by several shade lines, and there are two or three small black spots at the end of the cell. The hind wings have a large dark smoky brown spot near the hinder margin, and a broad band of the same color a little within the outer margin, which changes into lines and black spots towards the anal angle.

When first hatched and for some time afterwards, the larva is green with a tinge of pink along the sides, and with a very long, straight, pink caudal horn. This horn soon shortens and curls up like a dog's tail (Plate III, Fig. 2, *c*). As the larva grows older it changes to a reddish brown, and after the third molt, entirely loses the caudal horn, leaving only a glassy tubercle in its stead.

The mature larva when in motion (Plate III, Fig. 2, *a*) is nearly four inches in length, but when at rest it draws in the forward segments so that it is an inch or more shorter (Plate III, Fig. 2, *b*). It is pale green above and grows darker on the sides. Mr. Saunders states that as it approaches maturity it changes to a reddish brown color. There are six somewhat oval, cream colored spots tinted more or less with pink, on each side from the sixth to the eleventh segments inclusive, in which are situated the black spiracles, and there are numerous black dots sprinkled over the anterior segments.

"When the larva is done feeding it descends from the vine and buries itself in the ground where it forms an oval cell, and changes to a chestnut brown pupa with the segments roughened with impressed points, and there is a long thick spine at the end of the abdomen." The tongue-case is sunken.

This species feeds on the leaves of the Grape and Virginian Creeper (*Ampelopsis quinquefolia*). It has not been found at Orono, but occurs at Portland and in Kittery, Maine, and further south.

28. Philampelus achemon, Drury.

Phi-lam'-pe-lus ach'-e-mon.

Plate IV, Fig. 1.

Expanse of wings, nearly four inches.

The upper side of the head, thorax, abdomen and fore wings is of a reddish ash color. There is a large triangular spot on each side of the thorax over the base of the wings, another on the costa before the apex, one on the hinder margin near the anal angle, and a large nearly square spot on the middle of the hinder margin, all of a deep rich reddish brown color; and there is also a small spot of the same color near the middle of the base of the wings. The veins are lighter in color; and there are several dark lines crossing the wing, one near the base, two more beyond, which end at the inner side of the square spot, one from the middle of the costa, strongly angulated in its course, and two or three from the outer fourth of the costa which are angulated on vein 4.

The hind wings are pink with a reddish ash colored outer border which has a row of elongated dark brown spots along its inner edge, not very clearly defined through a part of its course, and there is a diffuse dark reddish spot above the anal angle. The under side is roseate.

The newly hatched larva is of a pale apple green color with a distinct yellowish dorsal line, and light, perfectly straight subdorsal lines. Caudal horn, about half as long as the body, slender, recurved and reddish. After the second molt the color sometimes changes to a clear, light cherry-color growing brighter for several days. The mature larva is about three inches long when at rest (Plate IV, Fig. 2, represents the mature larva at rest with the head and anterior segments retracted), and three and a half when in motion. It varies in color from pale straw to reddish brown, growing darker on the sides and becoming dark brown beneath. An interrupted line of brown runs along the middle of the back and an unbroken one extends along each side; beneath which there are six cream colored oblique spots, one on each segment from the sixth to the eleventh inclusive. The surface is sprinkled with dots which are dark on the back but lighter and annulated on the sides. The head and two following segments are small and partially withdrawn into the fourth when at rest. The caudal horn disappears before the larva reaches maturity and its place is represented only by a polished tubercle with a central black dot.

After it is done feeding it burrows into the ground to the depth of several inches, where it forms a cell or earthy sort of a cocoon within which it changes to a dark, shining mahogany colored pupa with a prominent head-case, the tongue-case sunken to a level with the surface of the body and extending to the end of the wing covers. The abdominal segments have their surface thickly punctured except on the posterior edge. (Plate IV, Fig. 3.)

This species feeds on the leaves of Grape and Woodbine (*Ampelopsis quinquefolia.*)

Genus XV, CHŒROCAMPA, Duponchel, Hist. Nat. Suppl. II, p. 159 (1835).

Chœ-ro-cam'-pa.

Head of medium size and smoothly scaled; proboscis as long as the body; palpi ascending, close to the front; eyes large, scarcely lashed; thorax smooth, moderately advanced in front of the fore wings; abdomen very long and gradually tapering to a point without anal or side tufts, the segments not armed with spinules on the hinder edge; tibiæ not spinose, the middle tibiæ with one pair of very unequal spurs, the hind tibiæ with two pairs.

Fore wings long and narrow, with twelve veins, and they have the apex somewhat produced; hind wings with the outer margin sharply produced on vein 1 b, otherwise entire.

29. Chœrocampa tersa, Linneus.

Chœ-ro-cam'-pa ter'-sa.

Expanse of wings, from two and a half to three inches.

The upper side of the head and thorax is olive brown with a whitish roseate stripe along each side. The patagiæ are edged with rust brown, and the abdomen has a broad brownish band along the middle, which contains five darker parallel lines, and the sides are rusty yellow.

The fore wings are light brownish yellow, somewhat purplish on the base except below the origin of vein 1, where there is a dark smoky brown spot, with seven or eight nearly straight brown lines extending from the apex to the hinder margin. These lines diverge so much that the inner ones extend nearly to the base of the wing, while the outer ones are nearly parallel with the outer margin. Discal spot dark brown and minute. The hind wings are black with a terminal brown band and a subterminal row of wedge-shaped yellow spots, and a large spot of the same color rests on the anal angle.

The mature larva is described as light green, with a large subdorsal crimson ocellus on the fourth segment, containing a blue ring and edged with black and white rings, with six others smaller and similar, placed on a white subdorsal line which begins on the second segment and extends to the crimson caudal horn. The back is sprinkled with brown points. The spiracles are yellow, dotted with black points above and below. It is said to feed on Button-weed (*Spermacoce glabra.*) The larval transformations take place in an imperfect cocoon on the surface of the ground.

This southern species has been taken in Massachusetts and further south.

Genus XVI, EVERYX, Boisduval, Hist. Nat. Ins. Sphingides, *Ev'-er-yx* p. 208 (1874).

Head small, with the scales forming a central ridge or tuft between the antennæ; proboscis about half the length of the body; palpi of medium length, curving up and pressed against the front; eyes of medium size and slightly lashed; antennæ slim, fusiform, prominently hooked at the end, biciliate in the males but simple in the females; thorax short and stout, but little advanced in front of the base of the fore wings, vestiture smooth; abdomen large, cylindrical, tapering rather suddenly on the last segments; without anal or side tufts, segments without spinules along the hinder edge; tibiæ not spinose (fore and middle tibiæ spinose in *E. chœrilus*); middle tibiæ with one pair of comparatively long, unequal spurs, the hind tibiæ with two pairs.

The fore wings have eleven veins, the apex falcate or the outer margin excavate from the apex to vein 4, and rounded beyond. The hind wings have the outer margin excavate between veins 1 b and 3, but nearly straight beyond this to the apex.

The species may be separated as follows:

1	Thorax reddish brown	*E. chœrilus.*
	Thorax greenish	2
2	Under side of fore wings, reddish and gray, without yellow markings....................	*E. myron.*
	Under side of fore wings, bright green, with yellow markings	*E. versicolor.*

30. Everyx chœrilus, Cramer.

Ev'-er-yx chœ'-ril-us.

Expanse of wings, from two and a half to three inches.

The upper side of the head and thorax is of a rust red color, varying to a brownish red, with the tips of the patagiæ and a spot on the side of the thorax at the base of the fore wings, pale gray. The abdomen is fawn colored, and the segments are narrowly edged with pale yellowish.

The fore wings are reddish brown with purplish reflections. The basal half is sprinkled with grayish scales and crossed by four curved brownish lines, and there is a discal dot of the same color. The outer part of the wing is of a darker reddish brown color and crossed by several indistinct paler lines, the inner edge being oblique and straight. The terminal space is colored like the base of the wing. The hind wings are rusty brown. The entire under side is pale rusty brown with indistinct terminal bands on the wings and two faint cross lines on each.

"The full grown larva has the head very small, as in all the genus, pale yellow green, with a darker median line; second segment, yellow green with numerous irrorations. The spiracles in this segment are orange in the center, pale yellow above and below. In the other segments they are orange, white above and below. Segments three, four and five are also pale yellow green—the two latter swollen into a hump. The remaining segments are all bluish green, covered with white dots, and with a darker dorsal line. On segments five, six, seven and eight are oblique whitish bands; but on the posterior segments these are lost in a continuous line to the base of the caudal horn, which is bluish at the base, pale green at the tip, and white in the center. The anal segment is yellow green, as also are the abdominal legs. The thoracic feet are green, with the sides orange red. Previous to change, the caterpillar assumes a purplish leaden hue, the dorsal and lateral lines becoming blackish. One specimen is pinkish, with the four anterior and the anal segment of a brownish cast, and with a dark dorsal stripe. The lateral line is also brown."

"The pupa is purplish brown, with a pink tint over the whole surface, slightly mottled. Wing-cases also mottled with black, spaces between the segments pitchy brown." Hy. Edwards and Elliot.

This species feeds on the leaves of Grape, Virginian Creeper (*Ampelopsis quinquefolia*), Sheep-berry (*Viburnum lentago*), Arrow-wood (*Viburnum dentatum*), Cranberry-tree (*Viburnum opulus*), Sour-gum (*Nyssa multiflora*), Clammy Azalea (*Azalea viscosa*), Purple Azalea (*Azalea nudiflora*).

31. EVERYX MYRON, Cramer.

Ev'-er-yx my'-ron.

Plate V, Fig. 1.

Expanse of wings, about two inches and one-fourth.

The head, palpi and thorax are of a dark olive green color, with a dull reddish triangular spot on the back part and a pale ash colored stripe on the side over the base of the wings. The abdomen is dull greenish with dull reddish reflections.

The fore wings are of an olive gray color with a curved olive green oblique band crossing at the basal third; a discal point, and a second oblique band starting from the outer third of the costa crosses to the middle of the hinder margin. This band is nearly obliterated in the middle. The outer part of the wing is shaded with olive green at the apex and the anal angle, leaving the rest of the terminal space olive gray. The hind wings are dull red with a darker more or less complete terminal band which is greenish towards the anal angle. The under side of the fore wings is pale reddish except the costa and outer border, which, together with the under side of the hind wings and body, are greenish gray, and there is a central slightly darker band on the middle of the hind wings.

The females deposit their eggs singly or in groups of two or three on the under side of the leaves of their food plants. These eggs are nearly globular, about one-twentieth of an inch in diameter, of a pale yellowish green color but changing to reddish before hatching which occurs in five or six days. The young larva makes its first meal on the shell and then attacks the softer parts of the leaf. When first hatched it is about one-fifth of an inch long, of a pale yellowish green color, and has a long black caudal horn nearly half as long as the body. The markings of the larva change with each molt, and the caudal horn becomes relatively shorter.

The mature larva (Plate V, Fig. 2) is a little more than two inches long, with a rather small, pale green head sprinkled with yellow, and with a pale yellow vertical stripe on each side. The body is green, slightly darker than the head, and sprinkled with yellow dots. There is a row of seven spots varying in color from red to pale lilac, each set in a patch of pale yellow, along the middle of the back. A white stripe with a dark green margin, extends along the side from the head to the caudal horn, and below this are seven oblique stripes. The caudal horn is one-fifth of an inch long and varies in color from reddish to bluish green, granulated with black in front, and it is sometimes yellow behind and at the tip. A short time before transforming, the larva changes to a dull rose color throughout, with the stripes of a clearer rose color.

It transforms to a pale brown pupa on the surface of the ground, within a rude cocoon which it makes of leaves drawn together by a few silken threads (Plate V, Fig. 3).

This species feeds on the leaves of Grape and Virginian Creeper (*Ampelopsis quinquefolia*).

32. EVERYX VERSICOLOR, Harris.

Ev'-er-yx ver-sic'-o-lor.

Expanse of wings, two inches and three-fourths.

The head and thorax are dark green varied with greenish yellow, and the abdomen is greenish yellow or buff varied with darker green especially along the middle and on the hinder edge of the segments. There is a whitish line along the side of the head and thorax over the base of the wings, and one extending along the top of the head and thorax to the end of the abdomen, and the collar and patagiæ are edged with white.

The fore wings are dark green shading into lighter green and crossed by a number of whitish lines, three of which start from near the basal third of the costa and curve down and into a smoky white patch on the lower part of the base of the wing, and into which there runs a narrow, curved whitish band which starts from the middle of the costa. Three whitish wavy lines cross the wing from the outer fourth of the costa, and a subterminal line, starting from the apex and crossed by two strong white dashes on veins 6 and 7, runs irregularly down to the anal angle. The hind wings are rust red, grayish on the hinder margin and indistinctly greenish on the outer margin. The under side of the fore wings is dull reddish in the middle, while the costa and outer margin are green and marked with yellow and white somewhat indicating the markings on the upper side. The under side of the hind wings is shaded with green, yellowish and white.

The egg is round and slightly flattened—about the size of rape seed. It is at first light green and translucent, afterwards milky and opaque. The eggs hatch in about seven days. The larva, just emerged, is one-fourth of an inch long and of a whitish color. The caudal horn changes to a dark purple color in several hours after the hatching, and the larva gradually becomes pale green. The first molt is made in about five days after hatching, and the larva is then half an inch long, with a nearly spherical greenish head and a light green body. A lateral whitish line extends from the mouth to the caudal horn, which, as the age advances and size increases, is revealed to be composed of several lines as follows: a subdorsal line extending from each side of the mouth to the upper part of the eyes, and thence back to the rear of the fourth segment of the body; a similar line runs obliquely from the lower part of the fourth segment, under and just including the spiracle point, upwards and backwards to the rear of the fifth segment, meeting it just below the dorsal line. This is followed by five other and parallel lines, each beginning and ending one segment further back, except the last which extends across the last three segments up to the base of the caudal horn. There are faint indications of other lines on the lower part of the tenth and eleventh segments. The caudal horn is violet purple.

The second molt is made in four days, after which the head and body are of a light green color. The body is finely granulated and the markings are as before, but more distinct. Spiracles, marked with red points. The caudal horn, reddish, darker in front and behind than on the sides. The third molt is made in four days, after which the body is green, the markings as before, the fore legs, pink, spiracle points red, the body covered with granulations and much swollen at the fourth and fifth segments. The caudal horn is straight, greenish in front and behind, almost white on the sides. The fourth molt is made in six days, after which the head is small and with the four following segments is yellowish green while the rest of the body is pea green. Markings as before, without granulations, which have become white specks with which the body is more heavily marked on either side of the back, leaving the dorsal line green. Spiracles oval and red, with a yellow point at each end. Caudal horn stout, curved backward, sharply pointed, black in front and at the end, red on the sides. Some examples vary in having the ground color of the body pinkish brown instead of green, and with pinkish white shadings. At maturity the larva is from two and a half to three inches in length, and becomes bluish black before transforming which is done on the ground under leaves, in a slight cocoon made by drawing together leaves and grains of dirt with silk. The pupa is of a dirty light brown color, with dark chocolate brown spots. This account of the early stages is somewhat condensed from the studies of Rev. G. D. Hulst.

This rare species feeds on the leaves of Button-bush (*Cephalanthus occidentalis*), and Swamp-loosestrife (*Nesœa verticillata*).

Genus XVII, DEIDAMIA, Clemens, Syn. N. Am. Sph. p. 137
De-i-da'-mi-a. (1859).

Head small, with a tuft between the antennæ; proboscis rather more than half the length of the body; palpi short and shaggy; eyes small and lashed; antennæ fusiform and slightly hooked at the end; thorax stout, but little extended in front of the base of the fore wings; abdomen moderately long, conical and provided with a slight anal tuft, segments armed with spinules on the hinder edge; tibiæ not spinose, middle tibiæ with one pair of very short spurs, hind tibiæ with two pairs.

Fore wings long and narrow, with twelve veins and angulated on the outer margin. Hind wings slightly denticulate on the outer margin and produced on vein 1 b.

33. DEIDAMIA INSCRIPTA, Harris.
De-i-da'-mi-a in-scrip'-ta.

Expanse of wings, two inches.

The head and thorax are grayish brown with a double, curved, white line edged with brown across the prothorax, behind which are two other curved lines, one on the middle and the other on the hinder part of the thorax. The abdomen is ashy and has two rows of dark brown spots.

The fore wings are ashy gray at the base, in the middle and towards the apex. Three brownish bands cross the wing before the middle, another angulated band crosses beyond the end of the cell, and the outer border of the wing has two dark brown lunules on the margin below the apex, before the second of which is a third spot with more or less white between. The discal spot is paler than the ground color of the wing. The hind wings are of a dull reddish brown color with a dusky terminal band which grows narrow towards the anal angle. Fringes, white.

The mature larva is two inches long, of a fine green color, and the body tapers from the third segment towards the head. The caudal horn is whitish at the tip. They go into the ground (not very deep), and transform into very dark brown pupæ, with the tongue-case a short elevated ridge; a short central spine at the end of the head and a spinous tubercle on each of the eye-cases.

This species feeds on the leaves of Grape and Virginian Creeper (*Ampelopsis quinquefolia*).

Sub-Family—SMERINTHINÆ.

Genus XVIII, TRIPTOGON, Bremer, Bull. de l'Acad. Imp. St. Petersb. III. (1861).

Trip'-to-gon.

Head small and sunken with a central ridge of scales along the top; palpi very short and curving upward; proboscis membranous and about as long as the palpi; eyes small and without lashes; antennæ fusiform without a terminal hook, biciliate in the males, simple in the females; thorax short, stout and untufted, scarcely extended in front of the base of the fore wings; abdomen stout, cylindrical and tapering to a point in the females but blunt in the males, without anal tufts, the segments not armed with spinules on the hinder edge but with numerous very fine spinules scattered uniformly over the upper surface of the abdomen, not visible till the scales are removed; tibiæ not spinose, the fore tibiæ with a single, stout, slightly curved spine at the end; middle and hind tibiæ, each with one pair of short spurs.

Fore wings ample, with twelve veins and with a regularly scalloped outer margin. Hind wings ample, the outer margin somewhat produced on vein 1 b, and slightly scalloped beyond.

34. Triptogon modesta, Harris.

Trip'-to-gon mo-des'-ta.

Expanse of wings, from three and a half to four inches.

The head, thorax and abdomen are pale gray or olivaceous. The basal third of the fore wings is pale gray with faint shades crossing it. A broad olive band with wavy outlines crosses the middle of the wings, within which there is a small pale discal spot. The outer part of the wing is olivaceous and crossed by three lighter shade bands. The hind wings are dusky rose color in the middle, pale gray on the costal and hinder margins and olivaceous on the outer margin. There is a bluish gray patch with a curved black streak over it, near the anal angle. The under side of the wings is pale olive gray and crossed by several shade lines, and a large triangular patch of dusky rose color rests on the basal half of the fore wings.

The following account of the early stages is taken from Mr. Robert Bunker's paper in the Canadian Entomologist, Vol. IX, p. 210. The egg is one-eighteenth of an inch in diameter; light green, translucent, smooth, circular, oblate or depressed. The eggs hatch in nine days and the young larva is one-fourth of an inch long, light green, slender; head large, round, slightly depressed medially; face pink, with a purplish tinge; extremity of the body dark sea-green, with a large wart or tubercle, pyramidal in form, upon which rests the horn.

After the first molt the larva is half an inch long, of an apple green color, with a light yellow longitudinal subdorsal stripe, yellowish white diagonal lines and a very short, straight and purple caudal horn. After the second molt the larva is seven-eighths of an inch long, of a rich dark green color, finely granulated, giving it a beautiful velvety appearance. The thorax has two transverse crests or collars studded with fine points tipped with white.

After the third molt the larva is one inch and one-fourth long, thickest in the middle, light green and otherwise unchanged. After the fourth molt the larva is one inch and seven-eighths in length, light green, coarsely granulated, granules studded with fine white points, giving the skin a frosted appearance; crests on thorax much reduced in size. After the fifth molt the larva is three inches long, the hind crest is lost and the anterior one is much reduced; the spiracles are small and rust red, the true legs brown, the prolegs brownish yellow, and the yellow longitudinal stripes are very obscure. The caudal horn is reduced to a mere rudiment. [Does it really molt five times?]

The pupa is two inches long, cylindrical and dark chestnut brown.

This species feeds on the leaves of Poplar and Cotton-wood.

Genus XIX, PAONIAS, Hübner, Verz. bek. Schm. p. 142 (1818).

Pa-o'-ni-as.

Head small and sunken, with a prominent ridge or tuft of scales between the antennæ; palpi short and curved upwards against the front; much shorter in the females than in the males; proboscis membranous, about as long as the palpi; eyes large and without lashes; antennæ fusiform, biciliate in the males, simple in the females, hooked at the end; thorax short and of medium size, scarcely extended in front of the base of the fore wings; abdomen long, cylindrical and tapering, without anal or side tufts; segments not armed with spinules on the posterior edges; tibiæ not spinose, the middle and hind tibiæ, each with a single pair of very short spurs at the end.

Fore wings comparatively long, with twelve veins and the outer margin quite regularly scalloped, while the hinder margin is deeply excavate before the anal angle. The hind wings have the outer margin somewhat scalloped and the costal margin straight to near the end of vein 8, where there is a prominent rounded angle extended forward.

35. Paonias excæcatus, Abbot and Smith.

Pa-o'-ni-as ex-cæ-ca'-tus.

Plate VI, Fig. 1.

Expanse of wings, from two and a half to three inches.

The entire surface of the head, thorax and abdomen is of a rich brown or fawn color, except a band of dark chestnut brown along the middle of the thorax, a line of the same color along the middle of the abdomen, and a light colored line on each side.

The basal third of the fore wings is yellowish brown or fawn colored, with one or two wavy dark brown lines. Beyond this part, the wing is chestnut brown, and crossed beyond the cell by three wide sinuous lines of the same color as the base of the wing. Discal dot dark brown. The hind wings are rosy red with a black spot containing a round blue center, and a wide chestnut costal border crossed by several whitish lines. The under side of the fore wings is rosy red, except the narrow costa and outer part, which are fawn colored and shaded with brown, and there is a patch of yellow before the anal angle. The under side of the hind wings is brownish, rosy on the hinder margin, and crossed by several lighter lines, outside of which the wing is shaded with yellowish.

This species lays over three hundred eggs which are somewhat globular but much depressed, and of a pale dull green color. The eggs hatch in seven or eight days, and the young larva is about one-fifth of an inch long, of a yellowish green color with a darker dorsal line. The head is pale green and much larger than the following segments, and the caudal horn is long and dull red.

The mature larva (Plate VI, Fig. 1) is about two inches and a half long, of an apple green color, lighter above and darker beneath, and covered with white-tipped granulations. There is a vertical white stripe on each side of the head, and seven oblique, pale yellow stripes on each side of the body, the last one being of a brighter yellow than the others, and extending upon the sides of the caudal horn, which is bluish green. There is also a short stripe on the side of the forward segments.

The pupa, which is chestnut brown, smooth and with a short obtuse terminal spine, remains under ground during the winter.

This species has a long list of food plants comprising Apple, Plum, two species of Wild Cherry, *Spiræa opulifolia*, *Rubus odoratus*, *Wistaria sinensis*, four species of *Ulmus* or Elm, two species of Oak (*Quercus*), Hazel-nut, Hornbeam and Hop Hornbeam. Two species of Birch (*Betula*), five species of Willow (*Salix*), four species of Poplar (*Populus*), *Tilia*, and *Rosa Carolina*.

Genus XX, SMERINTHUS, Latreille, Hist. Nat. Ins. III, p. 431 (1802).

Sme-rin'-thus.

Head small and sunken into the thorax, more or less tufted between the antennæ; palpi small and curving upward, shortest in the females; proboscis membranous, shorter than the palpi; eyes of medium size, without lashes; antennæ fusiform, generally hooked at the end, simple in the females, biciliate in the males (bipectinate in the male of *geminatus*); thorax of medium size or very stout, scarcely advanced beyond the base of the fore wings; abdomen cylindrical, tapering, short or median in length, without anal or side tufts, segments not armed with spinules; tibiæ not spinose (the fore tibiæ of *cerisii* has a short blunt spine at the end); middle and hind tibiæ each with a single pair of short spurs at the end.

Fore wings with twelve veins (sometimes eleven), with the outer margin more or less angulated and the hinder margin excavate before the anal angle. The hind wings have the outer margin somewhat produced on vein 1 b, and the costa rounded or excavate.

The species may be separated by the following table:

1	Hind wings yellow in the middle	2
	Hind wings rosy red in the middle	3
2	Thorax with a central yellow stripe	*S. myops.*
	Thorax with a central rust red stripe	*S. astylus.*
3	Pupil of spot on hind wing composed of two dashes; male antennæ bipectinate	*S. geminatus.*
	Pupil of spot on hind wing horse-shoe shaped; male antennæ biciliate	*S. cerisii.*

36. SMERINTHUS MYOPS, Abbot and Smith.

Sme-rin'-thus my'-ops.

Plate VI, Fig. 3.

Expanse of wings, two inches and a half.

The entire surface of the body and upper side of the fore wings is chocolate brown with purple reflections. The thorax has a central yellowish ridge, and there is a brown line along the middle of the abdomen.

The fore wings are crossed by a number of dark brown lines and shades. A narrow, oblique, dark brown band crosses from the basal fourth of the costa to a purplish brown shade on the middle of the hinder margin. The outer border is shaded with dark brown, and the discal spot is of the same color. There is a small yellow spot just within the anal angle, and another on the costa inside of the apex. The hind wings are yellow, broadly margined with brown on the costa, and extending around narrowly on the outer margin. Two or three light purplish lines cross the costal band of brown, and there is a black eye spot enclosing a blue pupil near the anal angle. The under side of the wings is yellowish, variegated with brown shades on the outer part and pale purplish cross lines.

The mature larva is about two inches long, of a bluish green color, with a bright yellow stripe on each side of the head, a row of reddish brown spots along the side of the back, and another row near the spiracles. There are six (?) oblique, bright yellow stripes on each side, and two short yellow lines on the forward segments. The caudal horn is green, tinged with yellow on the sides.

This rare species feeds on the leaves of Wild and Cultivated Cherry.

37. Smerinthus astylus, Drury.

Sme-rin'-thus as'-ty-lus.

Expanse of wings, two inches and a half.

The head, thorax, abdomen and fore wings are of a reddish brown or cinnamon color, much suffused with a lilac tint. There is a rust red ridge along the middle of the thorax, and a yellowish stripe along each side of the abdomen.

An ill-defined bluish black stripe rests on the greater part of the hinder margin, above the middle of which the wing is shaded with yellowish, and there is a yellow spot just within the anal angle, and another on the costa within the subterminal pale lilac shade line. Three cross lines of the same color start from the outer part of the costa but are soon obliterated. The hind wings are bright ochre yellow at the base which shades off into light cinnamon color on the costa and outer margin. There are two pale lilac cross lines visible only on the costa, and a round black eye-spot with a blue pupil rests on the wing near the anal angle. The under side of the wings is bright ochre yellow shaded with brownish, and crossed by several diffuse pale lilac lines.

The mature larva is about two inches long, "of a pale green color, beautifully variegated with dorsal and lateral yellow and red stripes and spots, somewhat in the manner of *myops*." The caudal horn is light brown at the base and tip, and pale green in the center.

The food plant of this very rare species is the Swamp Blueberry (*Vaccinium corymbosum*), Low Huckleberry (Miss Morton) and Rosaceæ.

38. SMERINTHUS GEMINATUS, Say.

Sme-rin'-thus gem-i-na' tus.

Expanse of wings, two inches and a half.

The head and thorax are pale gray, the latter with a rich dark brown triangular spot on the middle, which is rounded in front and widened out behind. The abdomen and under side of the body are brownish gray. The fore wings are gray with a faint rosy tint in some specimens. The discal spot is whitish and bordered with dark brown, and a dark brown line edged on the inside with whitish starts from the basal third of the costa at right angles with it, and runs about half way across the wing where it forms nearly a right angle, and then runs across to the hinder margin. The lower part of this line is wider and shades off on the outer side. A broad, dark brown, oblique stripe, starting from this line, occupies the space between veins 2 and 3, and ends at a narrow, somewhat wavy, pale band which crosses the outer part of the wing, within which is a darker shade band with a straight but still darker inner edge. Outside of the pale band there are several indistinct, sinuous lines crossing the wing, a dark brown spot just inside of the anal angle, a lunulate spot of the same color edged on the inside with white at the apex, and the outer border has a wide dark brown shade from the lunulate spot down to near the anal angle.

The hind wings are rosy red with gray costal and outer borders. There is a large black spot with two blue spots on it, near the anal angle and connected with it by a narrow black stripe. Occasionally a third blue spot appears on the black, and sometimes there is but a single one giving the variety *Jamaicensis*, Drury, which Rev. G. D. Hulst has bred from eggs laid by *geminatus*. The under side of the fore wings has the basal half rosy red, the entire costa and outer half, gray with the markings of the upper side faintly reproduced. The under side of the hind wings is gray and crossed by alternate bands of brown and whitish. The males have the antennæ strongly bipectinate.

The eggs are globose, somewhat flattened, of a pale green color, about one-fifteenth of an inch in diameter, and hatch in seven days. The larva when first hatched is about one-fifth of an inch long, of a pale green color, and the caudal horn is fuscous. The mature larva is about two inches and one-fourth long, of an apple green color somewhat lighter above, with pale green or whitish granulations over the surface. The head has a yellow stripe on each side, and there are seven oblique stripes on each side of the body, of a pale yellow color except the last which is bright yellow. There is also a stripe on the side of the forward segments. The anal shield and plates are granulated, and of a darker green than the rest of the upper surface, but of the same color as the under surface. The caudal horn is slightly curved, of a violet color and granulated.

This species feeds on the leaves of Apple, Plum, Elm, Ash and Willow.

39. Smerinthus cerisii, Kirby.

Sme-rin'-thus ce-ris'-i-i.

Expanse of wings, three inches.

The head, abdomen and under side of the body are brownish gray. The upper side of the thorax is of a rich dark reddish brown, except the collar and patagiæ which are pale gray.

The fore wings are pale gray with two or three wavy brownish lines across the base of the wing; and a darker brown line, starting at right angles from the basal third of the costa, extends a little more than half way across the wing, where it turns, forming nearly a right angle, and runs to the basal third of the hinder margin. This line is shaded broadly with brown on the outside, from the hinder margin up to, and into the cell, and outside of the cell it extends faintly to the costa. This brown shade is bounded on the outer side by four lines which cross the wing parallel to the outer margin. These lines are curved between the veins forming acute angles pointing inwards on the veins, and they are alternately of a pale gray and brown color. There is a pale gray spot on the hinder margin within these lines, and a brown spot on the outside which is followed by a pale shade on the anal angle. A pale, scalloped subterminal shade line extends across the pale brownish gray of the outer part of the wing, up to the pale gray or whitish lunulate spot near the apex. The veins are paler than the ground color of the wings.

The hind wings are dull rosy red in the middle and bordered all around with dull clay yellow, and there is a black spot connected with the anal angle, on the hinder part of the red, which contains a horse-shoe shaped spot of blue, the open part towards the anal angle. Sometimes the outer side is nearly or quite open, thus presenting two lunules facing each other. The under side of the fore wings is dull rosy red on the disk, but shaded with brown and gray over the rest of the surface. The under side of the hind wings is brownish gray crossed by three more or less distinct bands; one on the middle and the other two at equal distances apart between this and the outer margin.

The early stages and food plants of this exceedingly rare species are entirely unknown. It has been taken in Orono at light, about the middle of May.

Genus XXI, CRESSONIA, Grote, Proc. Ent. Soc. Phil. Vol. V, p. 186 (1865).

Cres-so'-ni-a.

Head small and somewhat sunken into the thorax, with a ridge of scales between the antennæ; palpi slim, of medium length in the males, much shorter in the females, ascending and divaricating at the tip; proboscis about as long as the palpi; eyes of medium size and without lashes; antennæ rather short, fusiform, simple in the females but bipectinate in the males; thorax short and stout, scarcely advanced beyond the base of the fore wings; abdomen slender and elongated with minute anal tufts in the males, segments without spinules; all the tibiæ spinose, the middle tibiæ with one pair of medium-sized spurs, the hind tibiæ with two pairs.

The fore wings have eleven veins, and the outer margins are somewhat dentate, and the apex is somewhat produced. The hind wings are evenly rounded and dentate on the outer margin.

40. Cressonia juglandis, Abbot and Smith.

Cres-so'-ni-a ju-glan'-dis.

Expanse of wings, from two and a half to three inches.

Palpi, cinnamon brown. Head, thorax and abdomen above, pale gray or fawn colored with a brown stripe along the middle of the thorax.

The fore wings are pale gray or pale fawn colored, with a nearly straight brown line crossing the wing from the basal third of the costa to the basal fourth of the hinder margin. A second line crosses the wing near the base and is more nearly perpendicular to the costa. The discal spot is brown, and there are two parallel oblique lines from the outer fourth of the costa where they are much curved, running nearly straight to the hinder margin, the inner one of which ends near the middle. Between this inner one and the first line described above, a more or less conspicuous brown spot rests on the hinder margin. A brown shade line is sometimes visible within and parallel to the two outer lines. The outer part of the wing is more or less shaded with brown. The apex has a lighter shade on the costa, and a diffuse more or less wavy line extends from it down to the anal angle.

The hind wings are colored like the fore wings, and have three nearly parallel somewhat wavy brown lines across the middle, followed by a brown shade on the outside. The whole surface of the body and wings is sometimes shaded with lilac purple.

The under side of the body and wings is brown with the outer oblique lines reproduced.

The young larva is yellowish green with the surface of the body covered with pale irrorations. The head is truncate in front, conical, the apex of the cone being furnished with two rough brownish projections, and there is a yellowish stripe on each side of the head. The lateral streaks of the body are very indistinct. The caudal horn is rough, pinkish at the base, and has black points on the surface.

The mature larva is about two inches and a half long, tapering from the seventh segment towards the extremities, light apple green, granulated with white, and with seven oblique stripes on each side formed by the whitish granulations which are more numerous there than elsewhere. The caudal horn is one-fifth of an inch long, brownish and covered with black spinules. The head is quite pointed and bifid at the top. Abbot and Smith give a figure of this larva, which is of a ferruginous color.

The pupa is blackish brown and roughened over the entire surface. There are four little prominences on the head-case, and the terminal segments are flattened on the ventral surface and have lateral, toothed appendages.

This species feeds on the leaves of Hickory (*Carya alba*), Black Walnut (*Juglans nigra*), and Iron Wood (*Ostrya Virginica*). Dr. Packard says it also feeds on Wild Cherry, but Mr. Strecker thinks he must be mistaken.

6

Genus XXII, ELLEMA, Clemens, Syn. N. Am. Sph. p. 187 (1859).
El-le'-ma.

Head small and somewhat sunken into the thorax, with a tuft or ridge between the antennæ; palpi rather short and slender; proboscis membranous and about equal in length to the palpi; eyes of medium size and scarcely lashed; antennæ fusiform, largest beyond the middle and ending in a somewhat bent, ciliated seta, simple in the females, biciliate in the males; thorax very short and stout, rounded in front and scarcely advanced in front of the base of the fore wings; abdomen cylindrical and tapering, without anal or side tufts; segments armed with round spinules on the hinder edge; fore and middle tibiæ spinose, middle tibiæ with one pair of medium sized spurs, hind tibiæ with two pairs.

Fore wings with eleven veins and an oblique, evenly rounded outer margin. Hind wings with an entire and rounded outer margin but slightly excavated between veins 1 b and 2.

41. Ellema bombycoides, Walker.
El-le'-ma bom-by-coi'-des.

Expanse of wings, from two inches to two inches and one-fourth.

There appear to be two forms under this name; the first, *bombycoides*, Walker, is exceedingly rare, while the variety *harrisii*, Clemens, is not uncommon. *Bombycoides* was described by Walker in his Lepidoptera Heterocera, part 8, page 233 (1856), where he established the genus *Lapara* for it and described the species as follows. "Cinereous. Fore wings with a zigzag oblique black line, and with several lanceolate black marks. Hind wings brownish, paler toward the base; ciliæ white. Length of the body 10 lines; of the wings 24 lines. Canada."

Mr. Herman Strecker has given a colored illustration of the insect on Plate XIV of his Lepidoptera Rhopaloceres and Heteroceres, from a figure executed by Prof. Westwood from the type which is in the Museum at Oxford, England.

Mr. Roland Thaxter informs me that he has taken at Kittery(?) an *Ellema* "which is practically the same with Strecker's figure of *bombycoides*," and as far as he can judge is that species. He also expresses the opinion that it is a variety of *harrisii*.

Variety *harrisii*, Clemens.

har-ris'-i-i.

Expanse of wings, two inches.

Head, palpi and thorax, umber brown. The tips of the patagiæ are white, and the disk has more or less white hairs mingled with the brown.

The fore wings are umber brown with whitish scales scattered over the surface, but leaving a discal spot, a pair of cross lines angulated on the cell, and a pair of cross lines beyond the cell, all of umber brown. The first line starts from the basal fifth of the costa, the second from a point on the costa twice as far from the base. These two lines extend obliquely out, the second one to the dark brown discal dot, then turning, they run to the hinder margin near the base, where they are lost in an indistinct reddish brown spot. The third line starts from the costa a little beyond the middle, curves outward around the cell and ends near the middle of the hinder margin. This line is sharply toothed on each vein. The outer line, which is the darkest and is followed on its outer side by a narrow brown shade, starts from the outer fourth of the costa, and runs across the wing parallel to the last, and is equally toothed on the veins. The space between these two lines is more heavily overlaid with white scales than any other part of the wing. Two black dashes rest on the wing, one between veins 2 and 3, the other between veins 3 and 4, and extend from the median vein out to the outer line. The fringes are white, cut with brown on the veins which are also marked with the same color on their outer ends.

The hind wings are umber brown, lighter at the base, and sometimes show a faint trace of a median band. The fringes are marked alternately white and brown. The under side of all the wings is grayish brown with a darker colored line, scarcely visible, crossing the outer part. Fringes colored as above.

The mature larva is from two inches to two inches and one-half long, and tapers from the middle towards each end. The ornamentation consists of alternate green and white longitudinal stripes. The dorsal stripe is green, spotted with red, and when the larva is in repose these red spots sometimes form a continuous stripe. The head is red in front with a white or pinkish white border. The collar and legs are green, the prolegs red, and the last segment is bordered with red. Caudal horn entirely wanting.

The pupa is chestnut brown with the tongue-case buried.

This species feeds on the leaves of White Pine (*Pinus strobus*).

42. Ellema coniferarum, Abbot and Smith.

El-le'-ma co-nif-e-ra'-rum.

Expanse of wings, two inches and one-fourth.

Head and collar, umber brown; thorax and abdomen, ashy gray and unspotted. The fore wings are ashy gray with an inconspicuous, brown line, dentate on the veins, preceded by a pale shade, crossing the wing from the outer fourth of the costa to the outer fourth of the hinder margin. This line is considerably rounded out beyond the cell, and curving in between veins 2 and 3, runs from this place to the hinder margin at right angles with it. Three cross lines starting from and visible only at the costa, divide the portion inside of the outer line into nearly equal parts. Two dark brown dashes rest, one between veins 2 and 3, the other between veins 3 and 4, and extend out to the outer cross lines. The fringes are white, cut with brown at the ends of the veins. The hind wings are brownish gray, paler at the base. Fringes white, cut with brownish at the ends of the veins. The under surface is pale brownish gray. Mr. Thaxter has taken what he regards as this species at Kittery, Maine.

Mr. Albert Koebele, who has bred this species in Georgia, states that they vary much. The fore wings vary in width, and many are uniform ash gray in color. Many have the two black dashes near the middle of the fore wing while some have but one. Some have a band of lighter gray across the wings, and others have dark lines and markings, while still others exactly resemble *Sphinx pinastri* of Europe, except that the abdomen is unspotted.

The eggs of this species are very dark green and hatch in eight days. The young larva has a round head, but it changes at the first molt to an angular form, running up to a sharp point at the top. There is no caudal horn at any stage of its history.

The mature larva is about three inches long, of a light yellowish green color with three white longitudinal stripes; one just below the dorsum, a second along the spiracles, and a third between these two at equal distances. The head is of medium size, light yellowish green and edged along the collar with a blue line. A black line runs from each corner of the mouth to the summit of the head where they unite. The head is somewhat conical and flattened in front. The spaces between the posterior spiracles and the under part of the body are strongly marked with red. Abbot and Smith represented the mature larva checkered with light and dark gray squares. This form was found by Mr. Koebele, but far less common than the other.

This species feeds on *Pinus palustris*, (A. & S). All kinds of pine, (*Koebele*).

INDEX OF GENERA.

INDEX OF SPECIES AND VARIETIES.

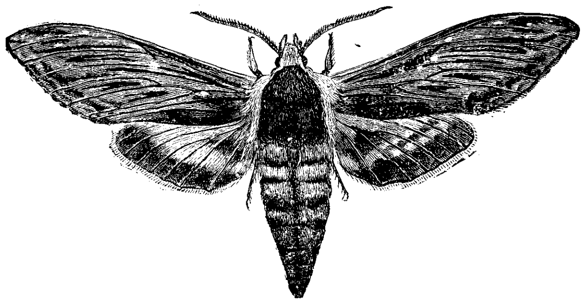


Fig. 1.—SPHINX GORDIUS.

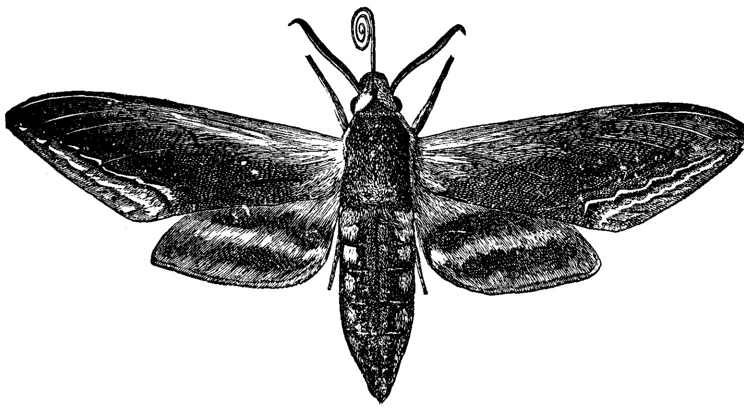


Fig. 2.—SPHINX DRUPIFERARUM.

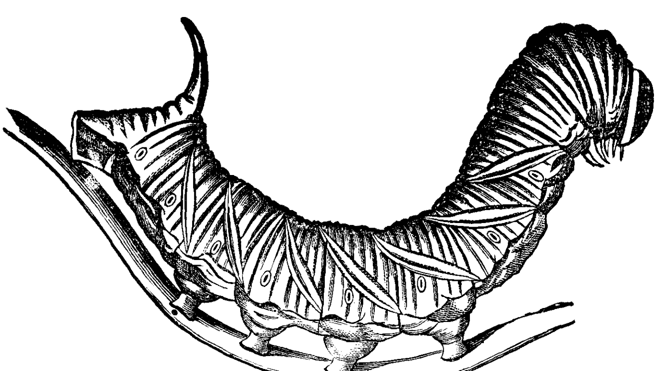


Fig. 3.—SPHINX DRUPIFERARUM, larva.

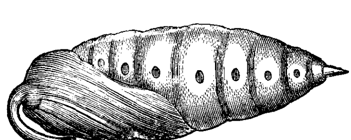


Fig. 4.—SPHINX DRUPIFERARUM, pupa.

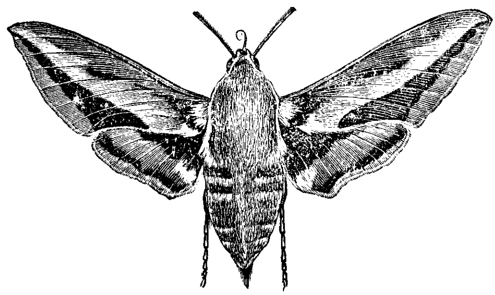


Fig. 1.—DEILEPHILA CHAMÆNERII.

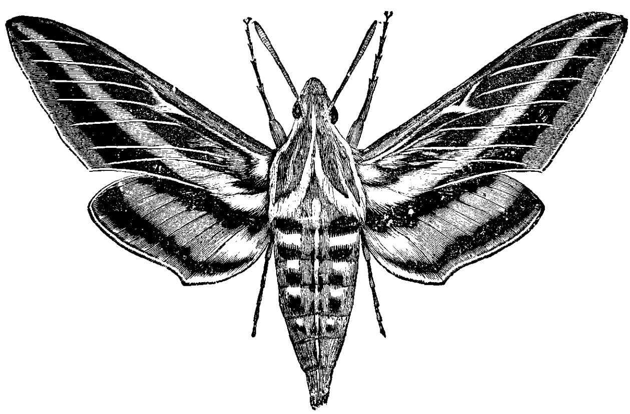


Fig. 2.—DEILEPHILA LINEATA.

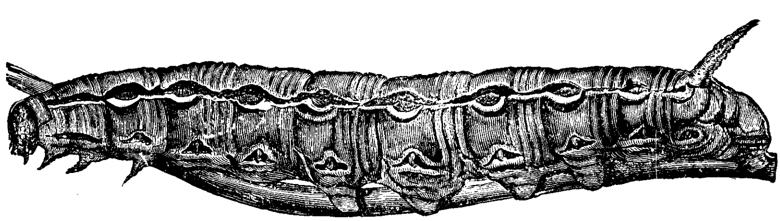


Fig. 3—DEILEPHILA LINEATA, larva.

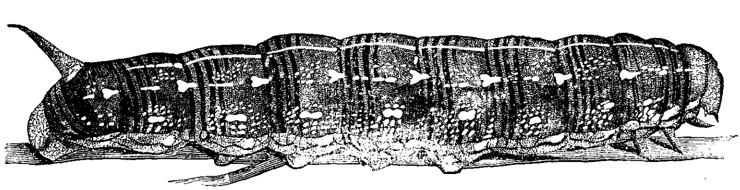


Fig. 4.—DEILEPHILA LINEATA, larva.

PLATE III.

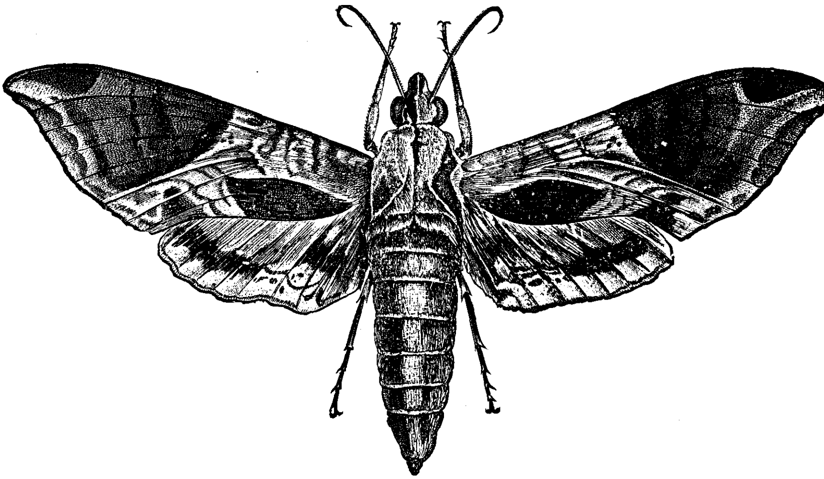


Fig. 1.—PHILAMPELUS PANDORUS.

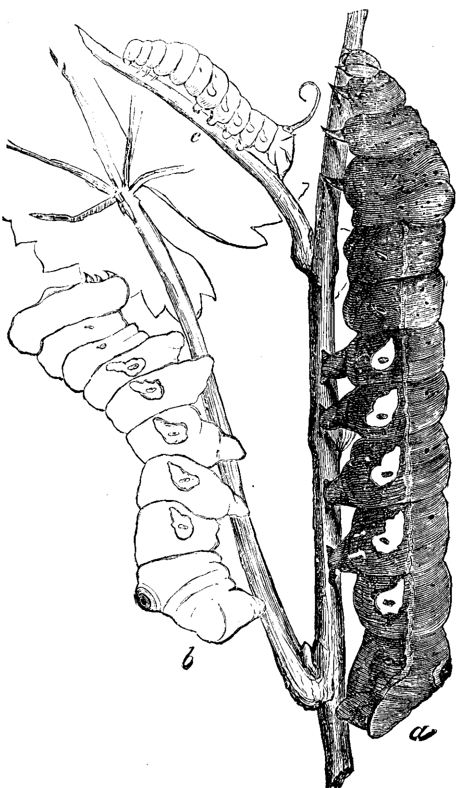


Fig. 2.—PHILAMPELUS PANDORUS.

a. Adult larva in motion.
b. Adult larva at rest.
c. Young larva.

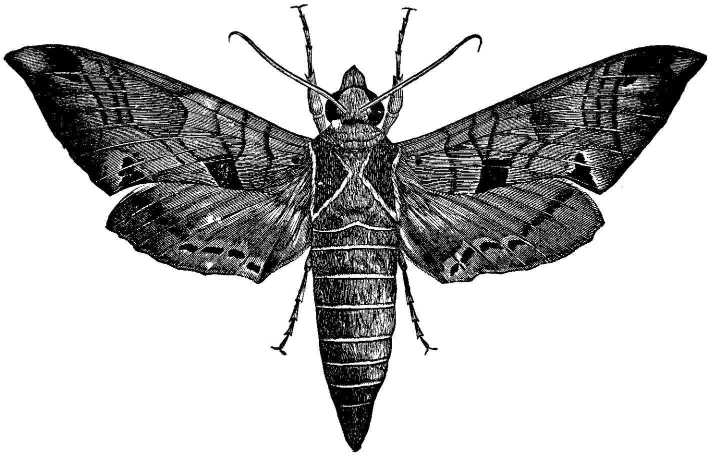


Fig. 1—PHILAMPELUS ACHEMON.

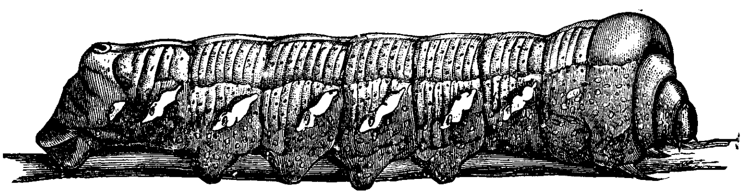


Fig. 2.—PHILAMPELUS ACHEMON, larva.

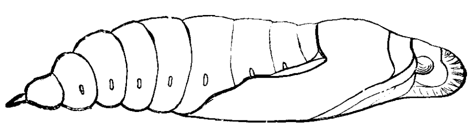


Fig. 3.—PHILAMPELUS ACHEMON, pupa.

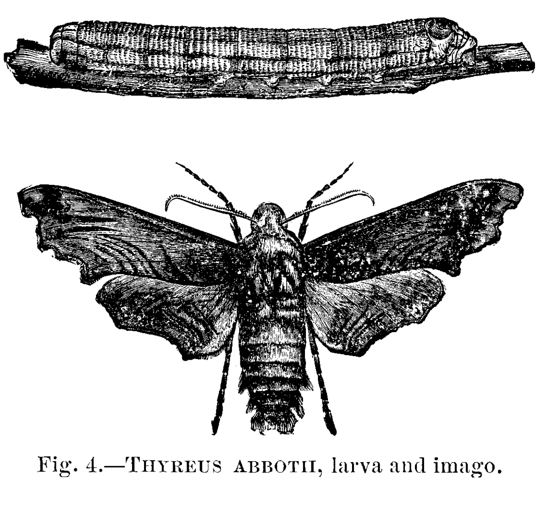


Fig. 4.—THYREUS ABBOTII, larva and imago.

PLATE V.

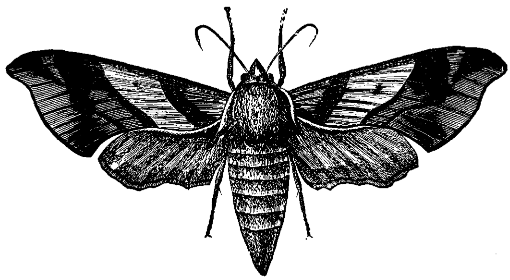


Fig. 1.—EVERYX MYRON.

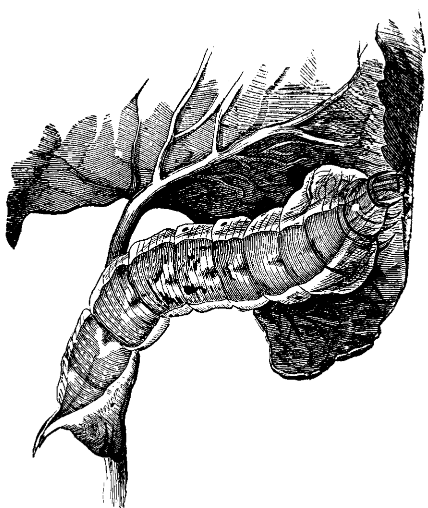


Fig. 2.—EVERYX MYRON, larva.

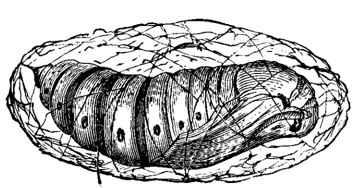


Fig. 3.—EVERYX MYRON, pupa in the cocoon.

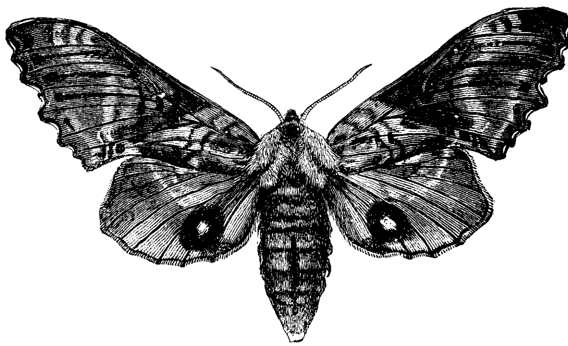


Fig. 1.—Paonias excaecatus.

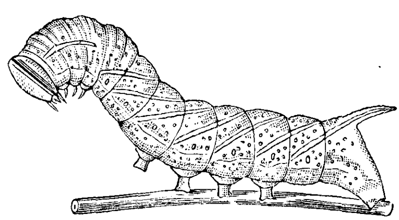


Fig. 2.—Paonias excaecatus, larva.

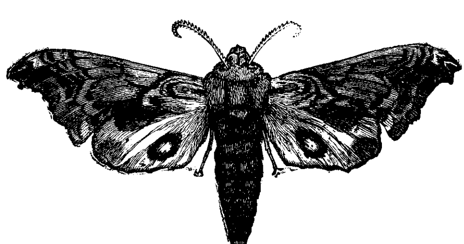


Fig. 3.—Smerinthus myops.